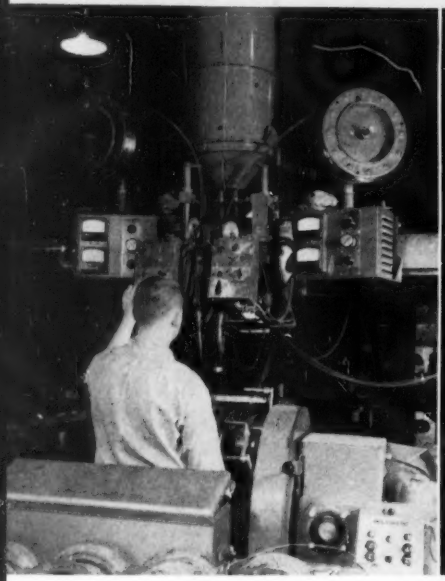
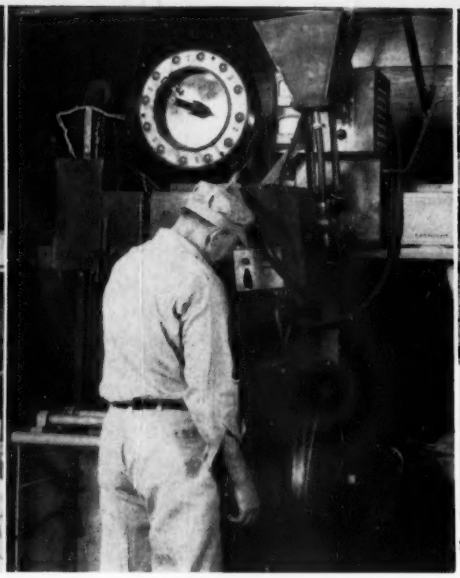
COAL MINING

February, 1959 Volume 36, No. 2

BECKWITH TRACTOR UNDERCARRIAGE REBUILDING WILL SAVE YOU MONEY!





ROLLERS IDLERS TRACKS

Add thousands of hours of life to your Caterpillar* track-type tractor running gear . . . track rails, rollers, idlers and sprockets . . . through Beckwith Machinery Company's rebuilding service. New rebuilding equipment of the latest submerged arc-welding type such as the Multimatic and L & B machines shown above in our shops can effect substantial savings for you on maintenance and new parts.

Under our "Fair Price" Roller Exchange Plan you pay only for the cost of bringing your trade-in roller up to factory new-parts standards, based on the class of wear of your old roller. You pay a fair price instead of a flat price. The "Idler Rebuild Offer" gives you free information to determine whether idlers are worn within limits so that they can be welded to effect savings. In Beckwith's "Rail Reviver Plan" we build up your track links to original specifications by submerged arc welding of both rails at once.

Check with any Beckwith field representative or see any of our Parts or Service Managers for complete details on this cost-saving service.

HERE'S WHAT TYPICAL OWNERS REPORT:

"I'm having Beckwith rebuild my Cat D9 rollers for the second time because the first welding job put them in such good condition that they gave me comparable service to the production line originals."

Wilmer Kimmel, Kimmel Coal Company of Arona, Pa.

"We are entirely satisfied with the appearance and performance of the undercarriage rebuilt for our D9 tractor by Beckwith. We are especially pleased with the substantial savings."

William Edmunds, Edmunds Contracting Company of Frenchville, Pa.

"Frankly, we have been hesitant to rebuild rollers, rails or idlers but after watching the performance of Beckwith-rebuilt items in the field we feel the quality of workmanship makes it worthwhile to have our Cat D9 undercarriage rebuilt by your specialists."

Ray Turner, E. N. Turner & Sons of Harrisville, Pa.

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BECKWITH MACHINERY CO.

BRADFORD, PA. • 361-369 Congress St. • Phone 3166
CLEARFIELD, PA. • Old Town Rd. • Phone 5-9635
ERIE, PA. • 1356 E. 12th St. • Phone 4-2494
SOMERSET, PA. • Rt. 219 N. • Phone Somerset 6533
CLARKSBURG, W. VA. • U.S. Rt. 20 • Phone Main 4-5476

6550 Hamilton Avenue • PITTSBURGH • Phone: MOntrose 1-6900

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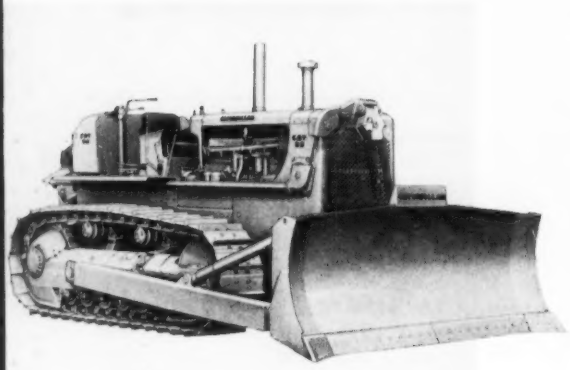
NEW!

Beckwith Machinery Company Presents

THE CAT D8 TRACTOR

— SERIES H —

Here's good news for the earthmoving industry—the new Cat Series H D8 Tractor is now in full production and available from Beckwith! A new Cat Turbocharged Diesel engine . . . tried, tested and approved by thousands of hours of exacting field trials . . . develops 225 horsepower to provide 18% more power than the previous D8. Instant response and efficient operation at all speeds is provided by the job-proved turbocharger which boosts the power and efficiency of the rugged D8 engine. Drawbar horsepower has been increased from 155 to 180.



The new D8 weighs 47,000 lbs, over 2 tons heavier than the previous model. It also has 50% more ground clearance than ever before. With an 84" track gauge there are 5505 square inches of track on the ground for better flotation and balance.

Lifetime Lubricated Rollers and Idlers, proved by more than 2½ million hours of rugged field service, require no further lubrication until rebuilding. Lubricant is kept in, dirt out, by special metal floating-ring seals.

A new dry-type air cleaner removes 99.8% of airborne dirt, even under the most severe field conditions . . . efficient at all engine speeds and temperatures . . . reduces air cleaner servicing time by at least 75%. This is new amazing protection for the heart of your tractor.

Also of interest is the new, six-speed direct drive transmission directly reversing in all six speeds with a high reverse speed of 6.4 MPH. The new high forward speed has also been increased to 6.3 MPH.

Your operators will appreciate the easy-to-use console mounted controls . . . hydraulic steering clutches . . . hydraulically boosted flywheel clutch and steering brakes. The foot-operated decelerator, available on torque converter model, allows operator to override hand throttle.

Consider all of these remarkable design advancements, remembering that the new Series H D8 is a thoroughly tested and job proved machine. May we tell you more about it personally? Call us today for complete details.

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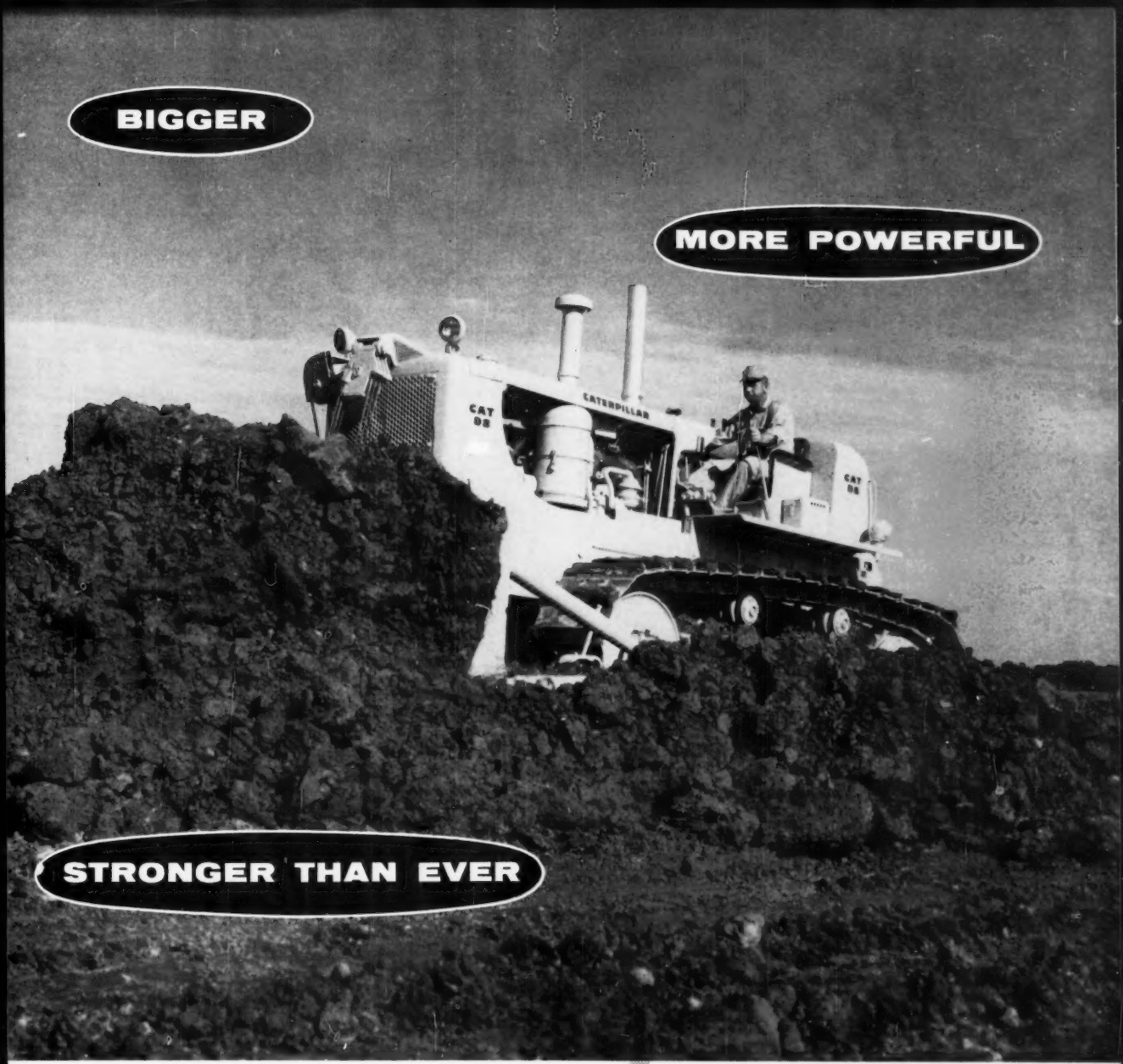


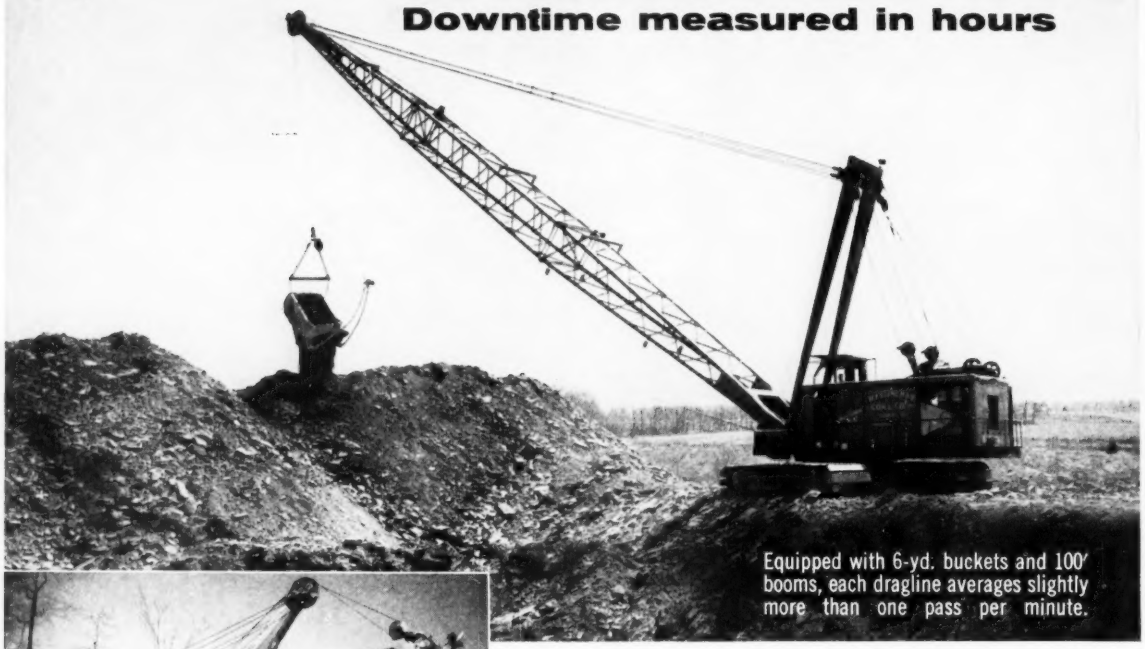
Introducing 7 new important features

- Lifetime Lubricated Rollers and Idlers
- 6 Direct Drive Speeds—1.5 to 6.3 MPH
- Advanced Lube System
- High Clearance
- Easily Serviced Dry-Type Air Cleaner
- Easy Working Console Controls
- Better Visibility, Safety, Efficiency

and continuing . . .

- The Exclusive Caterpillar Oil Clutch
- Oil Cooled Steering Clutches and Brakes
- Choice of Direct or Torque Converter Drive
- In-Seat Starting
- Live Power to Cable Control

Two 6-yard draglines move 4,992,000 yds. per year . . . work 6-day, 21 hour shifts... Downtime measured in hours



Equipped with 6-yd. buckets and 100′ booms, each dragline averages slightly more than one pass per minute.

Model 3000 shovel with 35′ boom and 27′ dipper sticks removing shallow overburden. Unit works up to two 8-hour shifts daily.

Model 3500 shovel has a maximum reach of 40′ and operates two eight to nine hour shifts each day.

"There's no question but that the Manitowoc Model 4500 dragline just can't be beat for a 6-yard machine in an operation like ours," says Mr. W. P. Stahlman, owner of the W. P. Stahlman Coal Co., Corsica, Pa. Proof of Mr. Stahlman's statement is found in the company's output records. Using two of the 6-yd. Manitowocs, over 16,000 yards of overburden, from 10 to 70 feet deep, are removed daily. Operating a 21 hour day, six days a week, that means the two draglines remove close to five million yards a year! ▪ "Despite the fact that we are using the draglines constantly, every week of the year, downtime can be measured in terms of several hours per year," Mr. Stahlman noted. ▪ In addition to minimum maintenance, the two 6-yd. diesel powered, Manitowocs offer on-the-job and between job mobility that can't be matched by electric machines. When moving from one coal seam to the next, the 4500's crawl under their own power without extensive preparations and with a minimum time loss. When transported from one job to another they can be loaded on trailers or flat cars with minimum disassembly. ▪ You can get more output and operating economy like this at *your* mine . . . your Manitowoc distributor has all the particulars. Call him now!

STAHLMAN'S 4-MACHINE MANITOWOC TEAM

2 Model 4500 6-yd. Draglines
1 Model 3500 Hi-Lift Shovel with 2-yd. dipper
1 Model 3000 Hi-Lift Shovel with 1¾-yd. dipper

Manitowoc

BASSLER EQUIPMENT CO.
FORTY FORT, PA.

ANDERSON EQUIPMENT CO.
BRIDGEVILLE, PA.

SHOVELS 1¼-Yd.—5½-Yd. • DRAGLINES 1¼-Yd.—6 Yd.

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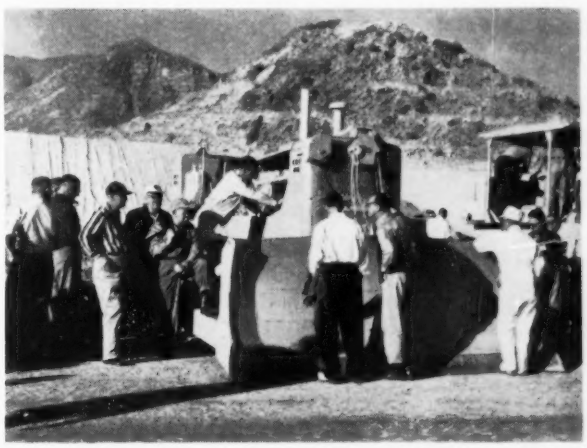


Caterpillar Dealers attending the recent Phoenix Sales Conference inspect the D8 Series H Tractor shipped from Caterpillar Tractor Co. Ltd. at Glasgow, Scotland, for the meeting. U. S. manufactured cable controls, hydraulic controls and bulldozer equipment were mounted after arrival of the tractor at the Phoenix, Arizona, Proving Grounds of Caterpillar Tractor Co.

Do You Know?

● Increased research on an electro-chemical device for the generation of electricity directly from burning fuel was advocated.

When developed beyond the present laboratory stage, the device, known as a fuel cell, could eliminate the need for furnaces, boilers, steam lines, turbines and generators.

Everett Gorin and Howard L. Recht of the Consolidation Coal Company of Library, Pa., described their work on fuel cells at the annual meeting of the American Society of Mechanical Engineers. They said that although there has ben sporadic research on fuel cells for almost a century. there has not been a decided awakening of interest before recent years, and that new cells are beginning to meet the demands of steady output.

Mr. Gorin described his fuel cell as an electro-chemical device similar to a storage battery, which operates by feeding a fuel continuously through the cell along with an oxidizing agent. A gaseous fuel, such as hydrogen or carbon monoxide, is used. Ultimately, the authors said, such gases could be produced from the world's abundant supply of coal.

The combustion of fuel in the cell is carried out in such a manner that electricity is generated rather than heat. This is done by having two elctrodes — a fuel electrode and an air electrode. The two gases contact these electrodes but do not mix with one another. They are separated by diaphragm that serves two purposes. It prevents the ordinary combustion reaction when two gases mix, and acts as an electrolyte, conducting the current and completing the electrical circuit

The fuel cell differs from an ordinary storage battery, said Mr. Gorin, in that it does not run down like a battery. It operates continuously as long as it is supplied with a fuel and an oxidizer.

To complete economically with existing power generating systems, fuel cells would have to be reasonably small, cheap to build, long lasting and efficient fuel burners. If such fuel cells could be developed, said the authors, they would permit coal to be competitive with nuclear power, as far as fuel cost is concerned, for a much longer period than would be the case for a conventional steam plant.

The work described by the authors was carried out under the sponsorship of the U. S. Army Signal Corps.

HERE AND THERE IN THE COAL INDUSTRY

John A. Stachura

● John A. Stachura has been appointed Vice President in Charge of Operations for Enoco Collieries, Inc., a subsidiary of the Enos Coal Mining Company. This announcement was made in Cleveland by George Enos, company President.

Mr. Stachura received his college training from Carnegie Institute of Technology and later was an instructor for Pennsylvania State Extension classes. In 1930 he began his mining carrer at the Duquesne Light Company's Harwick Mine where he was General Assistant Foreman. In 1941 he went to the Warwick Mine as Safety Engineer where he was later promoted to Assistant Superintendent.

From January to October, 1949, Stachura worked with the Pennsylvania Department of Mines. In October, 1949, he joined Enoco Collieries, Inc. as General Superintendent.

Stachura, who is 45, lives in Vincennes, Indiana with his wife and three children.

Fay Munger

● Fay Munger, 41, has been named Manager, Mining Research and Development Division by The Jeffrey Manufacturing Company, Columbus, Ohio. The announcement was made by Morton B. Curley, Chief Engineer, Mining Division.

A graduate of Tri-State College, Angola, Indiana, Munger came to Jeffrey in 1939 with a BS degree. He was assigned immediately to the division which he now heads. Named Assistant Manager in August, 1957, his newest appointment became effective January 12th.

Munger succeeds Sterling C. Moon, deceased, who headed the division the last 12 of his 32 years with the company.

● S. Austin Caperton, president of Slab Fork Coal Co., Slab Fork, W. Va., was elected president of the new Smokeless Coal Operators Association in Bluefield. The Smokeless group was formed by merger of the Pocahontas and Winding Gulf operators associations.

Progress of Hydraulic Mining in Russia

● In a report published by the British National Coal Board, London, on the findings of a Technical Mission, Published under the heading "The Coal Industry of the U. S. S. R., Part 2, No. 6 "Special Mining Techniques," a simple method of low-cost production as used in Russia has been described in some detail.

The trend in the Soviet Union to reduce coal production methods to as few operations as possible is exemplified in the hydraulic method of mining, by which system it is hoped eventually to achieve a seven-to-ten-fold increase in productivity in suitable conditions.

A great amount of experimental work has been carried out, but large-scale hydraulic mining has been confined to Polysayevskaya Northern Colliery and Tyrganskiye Uklony Colliery in the Kuzbass. In the former, the output in the fourth quarter of 1955 was 99 tons per man per month, and in the third quarter of 1956 125 to 130 tons. At Tyrganskiye Uklony, which is being reconstructed, output per underground worker is expected to reach 350 to 440 tons a month, which is four to five times greater than that achieved by conventional mining methods in neighbouring collieries. Furthermore, hydraulic mining costs per ton at both collieries are about half that of conventional methods and approach those of opencast work. About 70 installations operating on hydraulic systems are projected for the near future.

Outlining the work carried out at the foregoing two collieries in the development of hydraulic mining technique, it is stated in a section of the report of the British National Coal Board with regard to the process, that in breaking down the coal the primary object to be achieved is hydraulic saturation throughout a localized section of the face, which is promoted under hydraulic pressure between the innumerable natural fissures in the coal. This can be achieved either by some means of water infusion or by the disintegrating action induced by a high-pressure jet directed against the face, the pressure being increased or decreased according to the hardness of the seam. This hardness factor is of primary importance.

High Water Capacity Needed

The monitor nozzles employed at both collieries are relatively small, and range from ¼ to 1⅛ in. dia. The water capacity required is between 350 and 450 gal/min. although higher capacities of 750 to 800 gal/min. are required, depending on the thickness of seams. The capacity of a monitor is considered sufficient if the coal/water ratio is 1:5 but it is preferable to obtain a ratio of 1:3. Experience has shown that with proper initial preparation a monitor can produce coal at the face at the rate of some 50 tons/hr corresponding to a solids/liquid ratio of between 1:2 and 1:2.5.

Experience in controlling strata movements in the winning area without supports is only slowly being accumulated, but it is already possible to draw certain conclusions. Roof control is possible by varying the width of the pillar and the stall by the order of extraction in the stall, and by reducing the time of extraction. From experience gained at Polysayevskaya Northern Colliery it has been found that the width of the pillar in hydraulic extraction determines the amount of coal lost. The minimum loss of 10 to 15 per cent is ensured by a pillar width of 45 ft. By intensifying extraction it is possible to increase the pillar width to between 60 and 65 ft.

Under weak roofs the stalls must not exceed 13 to 15 ft., but a width of 20 ft. or so is permissable with stable roof strata. The time for extraction should not exceed 3 to 4 hr., but if possible it is better to complete extraction in 2 to 2½ hr. The stablility of the roof is important. In working medium to thick seams where the strata are strong or of medium strength it is possible to dispense with supports in the face workings and yet lose no more than 15 per cent of the coal. In weak starta, supports are required. At Tyrganskiye Uklony Colliery, in steeply inclined seams 13 to 20 ft. and 25 to 50 ft. thick the monitors were installed in the development roads and extraction carried out overhead without goaf support.

At the face, hydraulic transport is carried out along the floor of the working and can, if the face is short, proceed even though there is no gradient in the roadway. Over long distances, however, it becomes necessary to have a minimum gradient of 1 in 140. In the roadways it is customary to employ flumes for this purpose. Glass-lined flumes have been used in which the coefficient of friction is even further reduced and where the gradient factor is 0.007. According to the observations at Leningrad Mining Institute, such flumes are effective with a gradient as low as 0.02. Hydraulic transport under pressure is used at both collieries visited.

Hitherto, pumps used for hydraulic coal elevation have been of small capacity of up to 1,980 gal/min. A two-stage pump is being developed, designed to handle 3,300 to 4,000 gal/min of slurry against a head of 820 ft. To facilitate maintenance it is preferable to lay piping on the floor rather than in trenches, as this allows rapid clearance of any blockage which may occur through improper operating. Coal is sized before pumping and the oversize broken by hammer-crushers.

(Continued on Page 30)

COAL INDUSTRY AT BEGINNING OF REVOLUTION THAT WILL DWARF THE PAST

● Contemplation of the progress in technology in the coal mining industry to date provides no escape from realities of today and pressing hazards of tomorrow.

The intensive development of new machines in industry in recent years emphasizes the vast sweep of scientific and technological progress.

In the coal mining industry we are only at the beginning of a revolution that will dwarf the past. Science and Technology in coal mining are destined to move so fast they defy prophecy.

The industry which equips itself most widely and most wisely with the most efficient tools of production will be the strongest from the competitive standpoint.

The coal mining industry badly needs more of the adventurous spirit of risk and reward that motivates private initiative and the competitive urge that characterizes the American people.

The coal mining industry's ability to compete successfully with competitive fuels rests primarily upon its capacity to acquire more efficient tools of production.

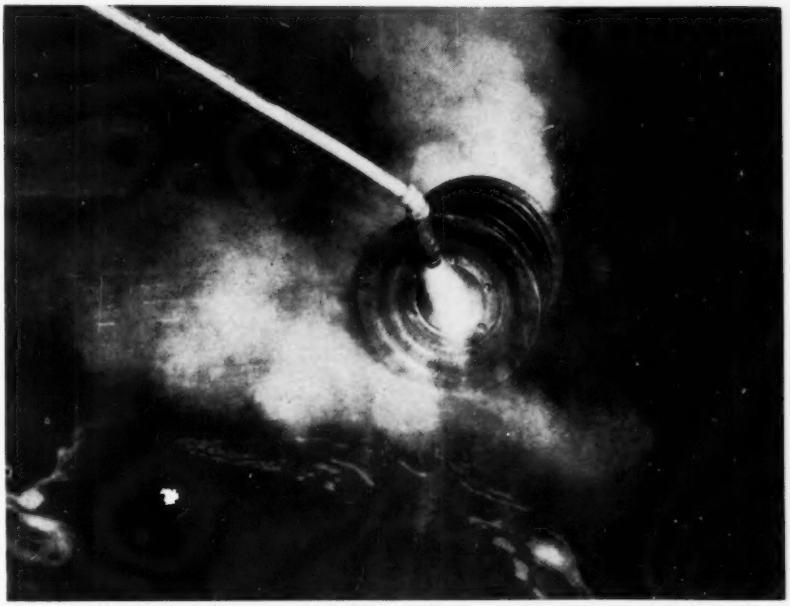
The coal mining industry MUST get in line with the American process of creating more for the many by providing more with better tools of production.

Rebuilding Tractor Undercarriage Components Can Effect Savings for Coal Strippers

● Rebuilding worn tractor rollers and idlers is becoming as popular with coal strippers as retreading worn truck tires. What could be more logical when metal wears off than to put it back on again—particularly when rebuilding costs only half as much as replacement with a new part? This is precisely what is done when tractor rollers and idlers are properly rebuilt with submerged arc automatic welding.

One concern with considerable rebuilding experience is Beckwith Machinery Company, a large Caterpillar dealer operating in Western Pennsylvania, West Virginia, and Maryland. They have developed the process to the point where they maintain a stock of rebuilt rollers which they supply to their customers on an exchange basis, with the price depending on the amount of measured wear on the worn roller which the customer turns in. Appropriately, this service is called Beckwith's Fair Price Roller Exchange Plan. The worn part is then rebuilt and placed in stock to be issued to a new customer.

Rebuilding the worn roller shell begins with a steam cleaning that removes all the grease and dirt. Starting with clean work is important because foreign materials



Figue 1 — The first operation in rebuilding tractor rollers is to steam clean them to remove dirt, grease and other foreign matter which, if not removed, could cause unsound welds.

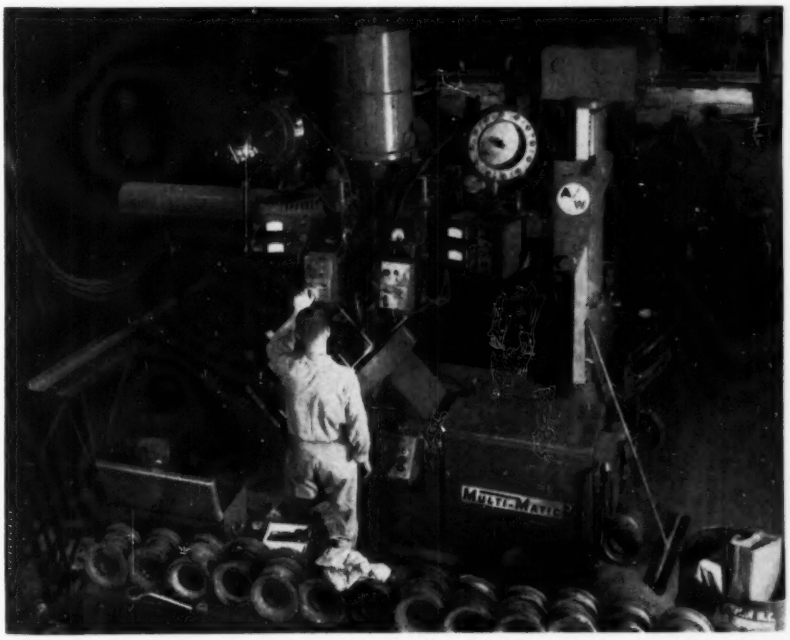


Figure 2—The Multimatic fixture with Lincolnweld automatic head used by Beckwith Machinery Company handles six rollers at one time. This arrangement keeps rollers from overheating and reduces bore shrinkage. Hardsurfacing flux is stored in large containers behind or above the welder. The electrode is measured as it is used, so that it is possible to accurately determine the cost of welding materials used on each set of rollers.

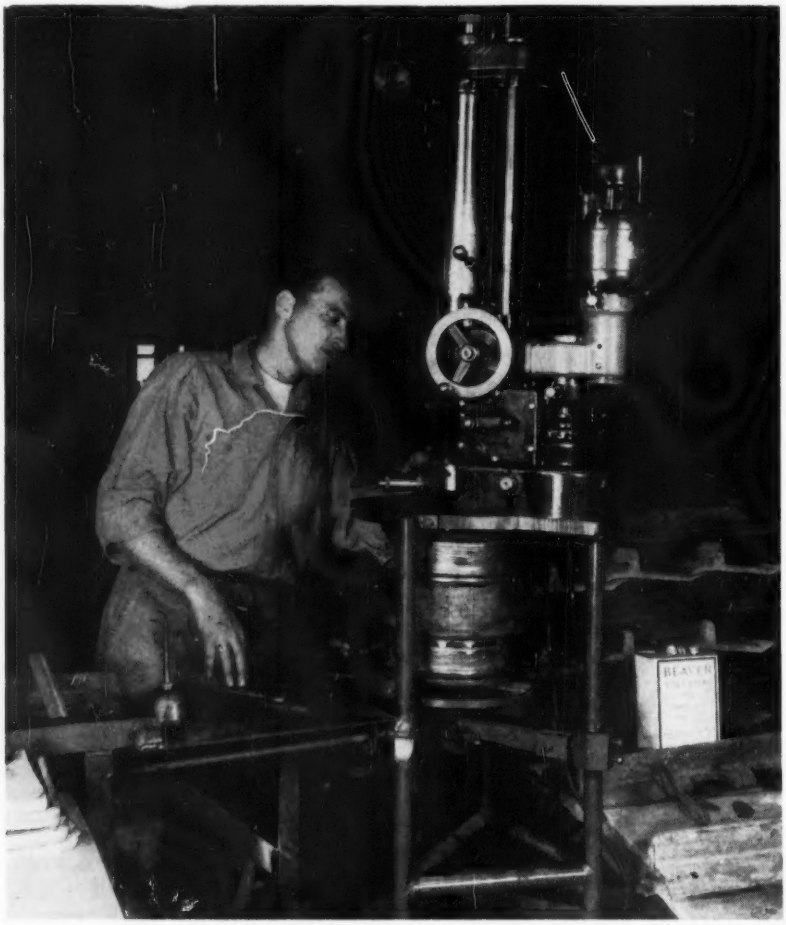


Figure 3 — After the rollers are rebuilt, the inside diameter is bored to size. This is the only finishing operation required on the rollers. The surfaces are smooth enough to be used in the as-welded condition.

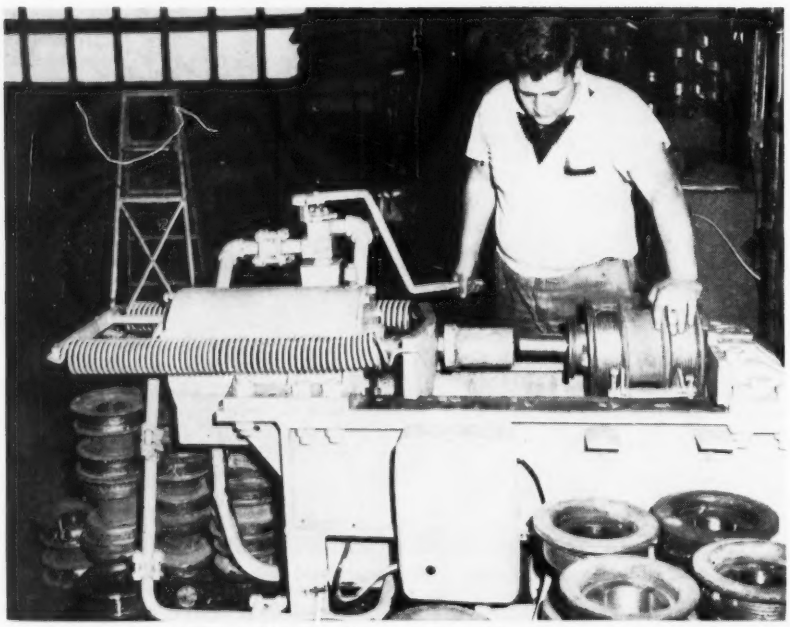


Figure 4 — A specially-built hydraulic press assembles shafts on the rebuilt roller. After completion, the rollers are put in stock to be sold on Beckwith's exchange plan.

cause porosity in the weld. Steam cleaning is simple and effective.

For welding, Beckwith places the rollers on a mutiple spindle Multimatic welding fixture. This fixture handles six rollers at a time. It resembles a turntable positioner with a boom-mounted, standard Lincoln Electric, submerged arc welding head above it. The turntables of the fixture revolves to position each of the six spindles under the welding head, one at a time. It also tilts to position the rollers for welding the flanges.

Mounting six rollers on the one fixture has the distinct advantage of reducing bore shrinkage during welding. With the six spindles, only one complete layer of build-up deposit is put on a roller at one time. Then, the turntable rotates and a second roller receives one layer. This process continues until all six rollers have received one complete layer before the first roller receives its second layer. In this way, each roller has ample time to cool between layers and does not build up too much heat. Consequently, there is less bore shrinkage.

Roller Build-Up Withstands Severe Shock Loads

The build-up material used on rollers by this dealer is Lincoln's mild steel L-60 electrode and H-535 hardsurfacing alloy flux. The procedure on all passes, except the last two, uses 400 amperes of welding current with 28 arc volts. Rollers move under the head at a speed of 25-35 ipm depending on size. Each bead overlaps the previous one by about one-third the bead width. This procedure produces a tough material that is capable of standing the severe shock loads sometimes encountered by the roller in service. The surface is very smooth.

The last two layers are deposited with a similar procedure, except that the arc voltage is increased to 32 volts. Increasing the arc voltage causes the weld metal to pick up more alloy from the hardsurfacing flux. The higher alloy deposit has more abrasion resistance than the

previous layers, so that it better resists the grinding action on the roller in dozing or backfilling service. This combination of a tough lower alloy build-up material, covered by the more abrasion-resistant, higher alloy, hardsurfacing layers, provides longest roller life under normal working conditions. The use of hardsurfacing flux with mild steel electrode is particularly beneficial because it permits changing the deposit by simply changing voltage without changing materials.

The entire turntable of the Multimatic welding machine is tilted about 60 degrees for welding up the flanges. This makes the side of the flange more nearly horizontal, so that it is easier to control the molten flux and weld metal and prevent spilling.

After the roller has been completely rebuilt, Beckwith rebores it to size. No finishing is required on the surface of the rebuilt roller. Bearings are inserted, when installed, with a specially-built hydraulic ram machine. Rollers are then ready for stock.

The cost of rebuilt roller shells is one-half or less than the price of a new replacement. The finished roller, complete with bearings, sells on an exchange basis for about one-quarter to one-third less than a new one.

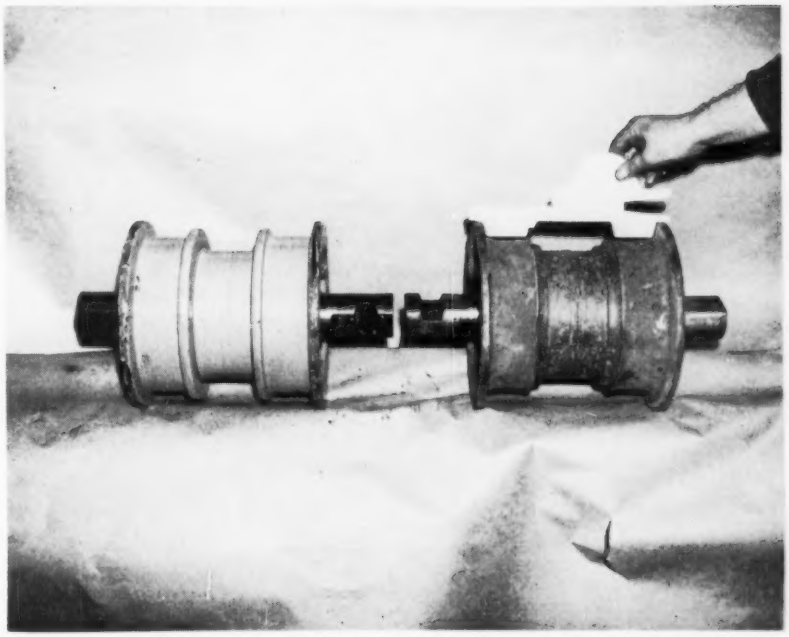


Figure 6 — A comparison of a rebuilt roller with a worn roller indicates the amount of material required to restore the roller to original size. Beckwith's Fair Price Exchange Plan is based on the amount of wear on the roller turned in.

Rebuilding Extends Idler Life

Beckwith also rebuilds idlers. They use the same welding materials and frequently the same machine. A single spindle turntable replaces the multiple spindle on the welding fixture, so that only one idler is welded at a time. Welding on idlers is continuous with no cooling between layers.

Deposits used on idlers are the same as those put on rollers. The first layers are the lower alloy obtained with 28 arc volts, while the final two passes are the higher alloy obtained with 32 arc volts. As with rollers, the turntable tilts for welding up the side of the flange, after the running surfaces have been finished.

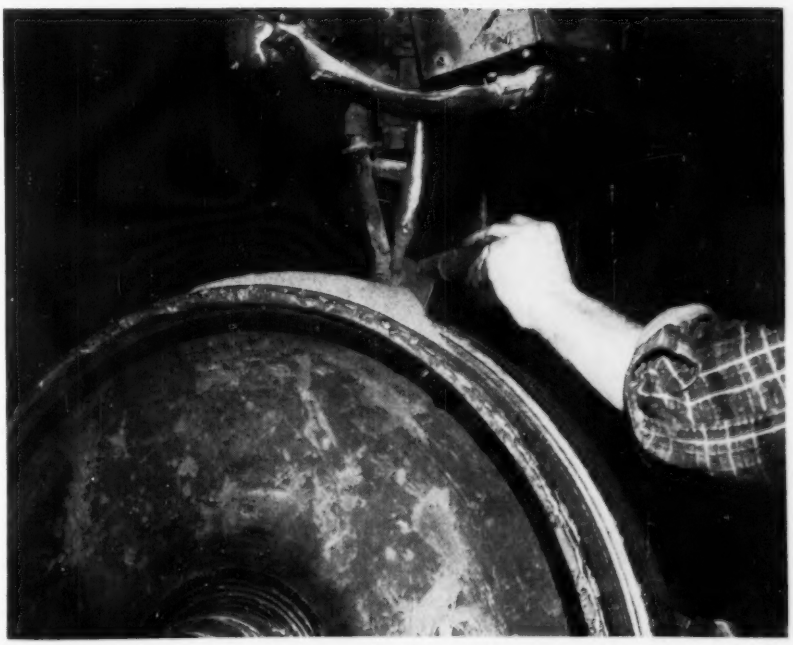


Figure 8—Rebuilding idlers is frequently done on the same machine that welds the rollers. A single spindle turntable replaces the multiple spindle turntable when welding idlers. Procedure is similar to that used for welding rollers.

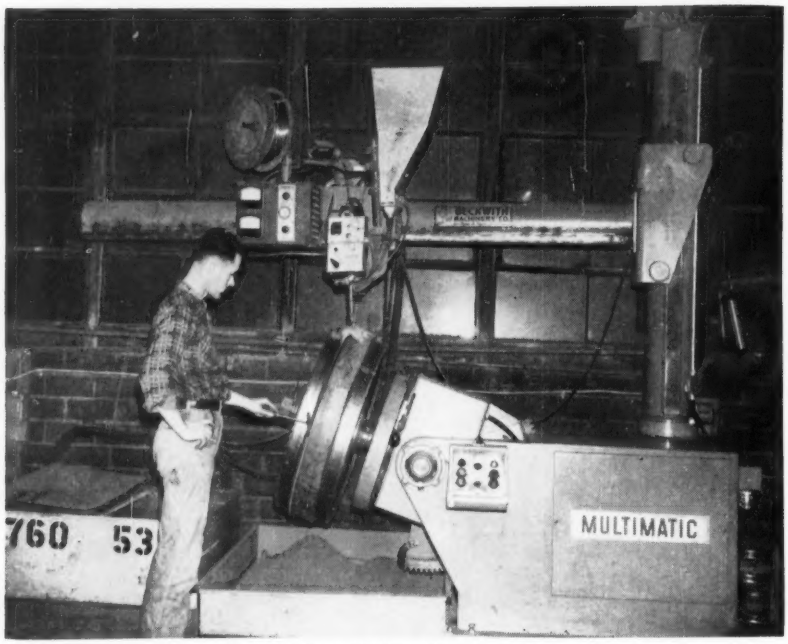


Figure 9 — The turntable tilts for welding the edges of the flange. This positions the edge, so that it better supports the molten metal and flux and prevents spilling.

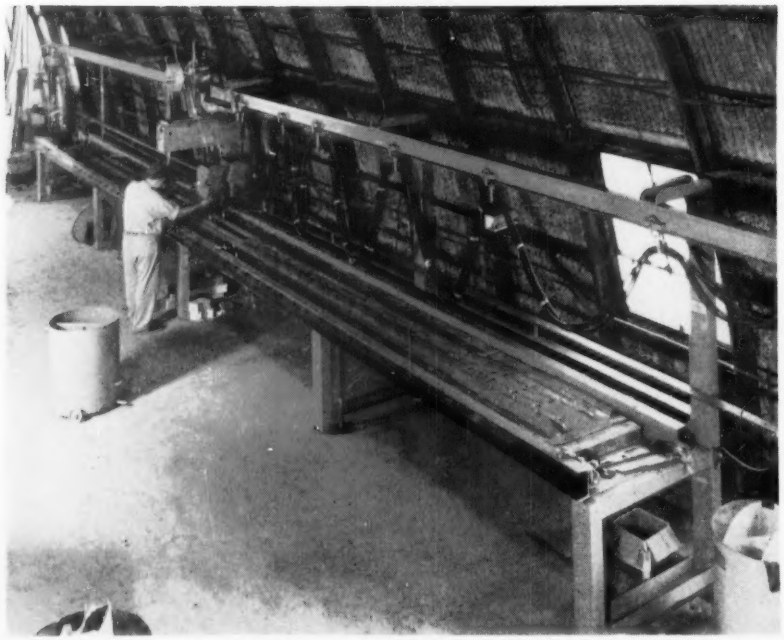


Figure 10—This track rail welder will completely rebuild worn tracks to their original dimensions with a new layer of super-hardened steel. Twin heads, welding simultaneously on each rail, insure equal deposits on both rail by controlled heat and rate of weld deposited.

When welding disc type idlers, the Beckwith serviceman pierces a hole in the side of the disc before starting to weld. This permits steam, caused by the welding heat acting on water trapped inside the idler, to escape rather than rupturing the idler.

After welding disc type idlers, the operator welds four or five pins between the two disc webs. This holds the webs apart, so that shrinkage stresses cannot distort them and pull them together.

Rebuilt idlers save the user about one-half the price of a new idler. This assumes that the idler is sent in for rebuild before it is too severly worn. If the idler is too badly worn, it is necessary to rebuild parts with manual electrodes before starting the automatic welding. When this is necessary, rebuilding costs increase and savings are less.

Automatic Welding Restores Track Rails to Original Strength and Size

Track rails of any length can also be rebuilt to original factory specifications, if submitted before reaching "the point of no return". Old, heavily-worn links can be processed with or without attached grouser pads. An automatic submerged arc welding machine with dual heads, travels the length of the rails, depositing a quality-controlled layer of hard weld on both rails at the same time. The number of required passes is determined by the degree of wear.

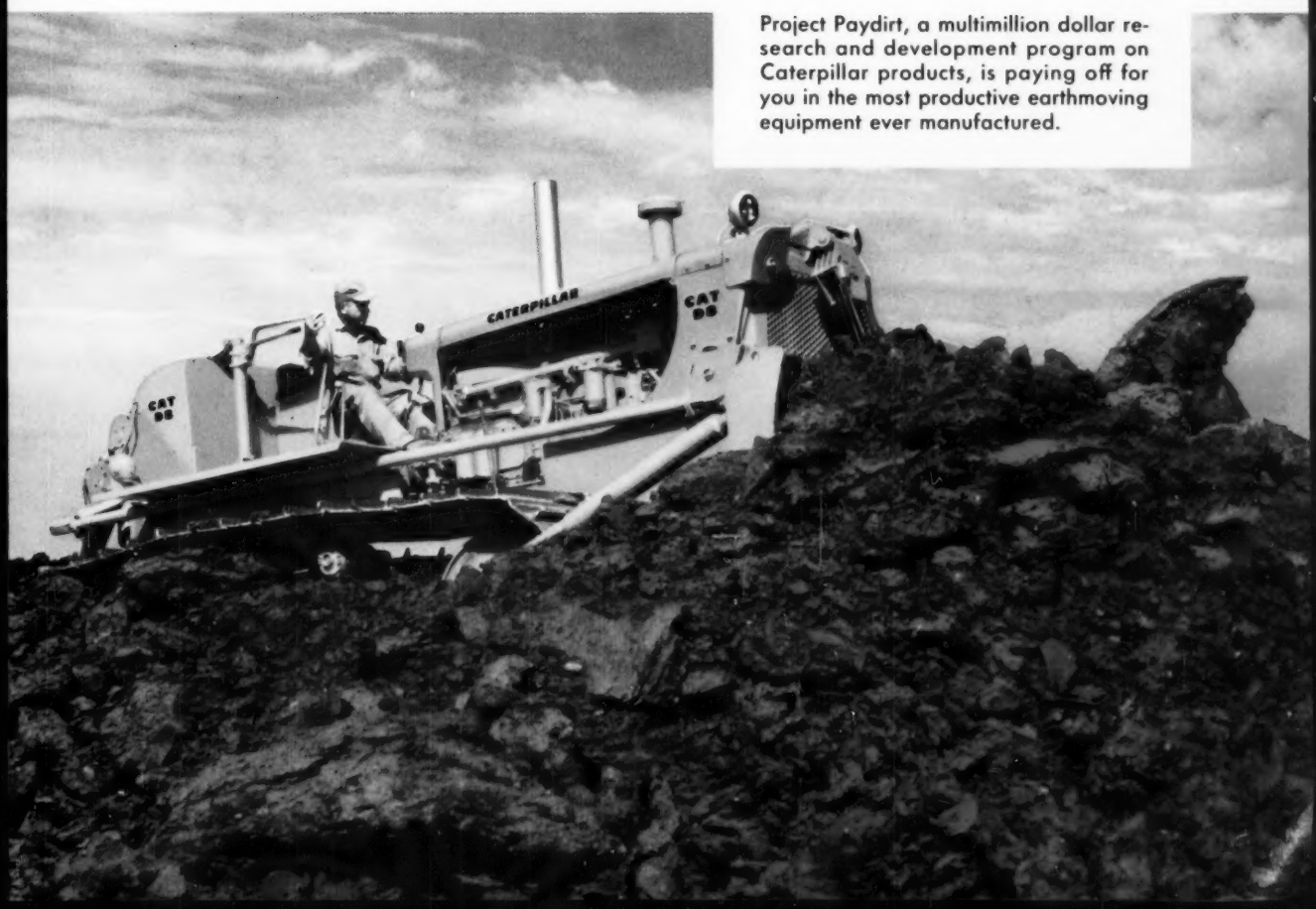
The life of rebuilt parts is at least comparable to that of new parts. Beckwith has kept track of many of the parts they rebuilt and find that they stand up at least as well as new ones. Response to Beckwith's rebuilding operations has been enthusiastic. Beckwith originally had one rebuilding setup at their Clearfield, Pennsylvania, shop. Then, they put another similar operation in Pittsburgh. Beckwith's customers have found that it pays to rebuild worn tractor parts. Other coal strippers may find the practice also profitable.

CATERPILLAR'S PROJECT PAYDIRT

PROJECT PAYDIRT pays off for you with a

New CAT D8 Tractor-SERIES H

Project Paydirt, a multimillion dollar research and development program on Caterpillar products, is paying off for you in the most productive earthmoving equipment ever manufactured.



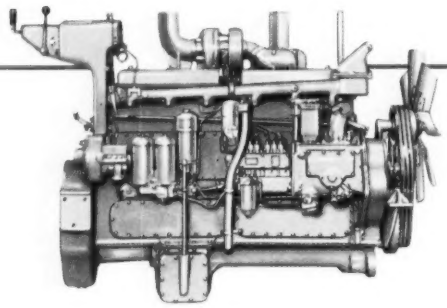
NEW D8

BIGGER! MORE POWERFUL!

MORE RUGGED THAN EVER!

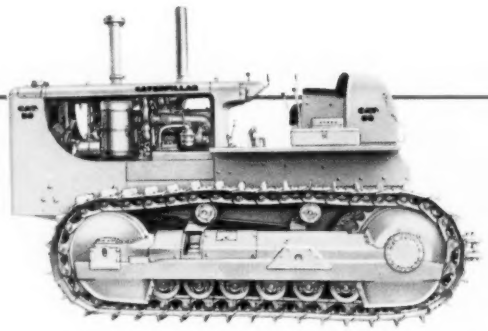
It's an important day for the earthmoving industry—the new Cat D8 Series H Tractor is here! It's new in every way—but already tried, tested and proved by thousands of hours of exacting field trials.

No other machine has ever received more critical attention, more brutal punishment. No machine has ever passed such severe tests so successfully. This is the crawler they'll all try to match—because the new Series H, like its predecessor D8s, is the pacesetter of its tractor class. See it at our headquarters—the powerful new D8! It is designed and built for big production and high availability.



NEW POWER

New, more powerful Cat Turbocharged Diesel Engine develops 225 Horsepower—18% more than the previous D8. And it has a 20% torque rise. Job-proved turbocharger boosts power and efficiency of the D8 Engine, gives instant response, assures efficient operation at all speeds. Drawbar horsepower is up to 180 from 155.



NEW DIMENSIONS AND WEIGHT

The new D8 is heavier—it weighs 47,000 lb., over 2 tons more. It has 84" track gauge, 5505 square inches of track on the ground. The new D8 has 19⅞" ground clearance —50% more than ever before—and the most in its class.

NEW

LIFETIME LUBRICATED ROLLERS AND IDLERS

Rollers and idlers are lubricated at the factory and will require *no further lubrication until rebuilding.* Special metal floating-ring seals keep lubricant in, dirt out, *for lifetime lubrication.* They're proved by 2½ million hours of rugged, on-the-job tests.

NEW

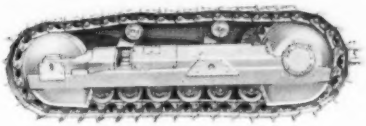
OPERATOR EFFICIENCY

Deck is free of obstruction, seat is designed higher for better visibility. Console-styled controls are handy, reduce operator fatigue. Foot-operated decelerator is standard on torque converter model, optional on direct drive. It allows overriding of hand throttle—frees hands for other controls.

NEW

DRY-TYPE AIR CLEANER

Reduces air cleaner servicing time by at least 75%. Removes 99.8% of all dirt from intake air, even under severe operating conditions, through double action of multicyclone precleaner units and cellulose filter element. Efficient at all engine speeds and operating temperatures.



NEW

UNDERCARRIAGE

All components are new to give the D8 extra long life characteristics for hard work and heavy loads. This includes stronger frames and braces, heavier shoes, pins, bushings and links.

The following features were proved on the previous D8 and retained by contractor demand:

DIRECT DRIVE OR TORQUE CONVERTER—Choice of direct drive or torque converter tailors D8 to *your* application. And a new direct drive transmission direct-reverses in all 6 speeds, with a high forward speed of 6.3 MPH, 6.4 reverse.

EXCLUSIVE CAT OIL CLUTCH—Regular equipment on D8s with direct drive transmission. Clutch facings protected by oil. Cuts maintenance and outlasts all other clutches by a wide margin.

LIVE POWER TO CABLE CONTROL UNIT—This assures full working operation of cable control unit at all times.

IN-SEAT STARTING—Controls are easily within reach—operator never has to leave the deck. This simplifies and speeds starting, increases efficiency.

FULL-FILTERED, PRESSURE LUBRICATED POWER TRAIN—Steering clutches and brakes are cooled by streams of oil, extending their life. And now, in addition, so are transmission and final drives, with the transmission, bevel gear and pinion, and steering clutches being serviced by one common lube system. In fact, the D8 is the only tractor in its class to have a completely *full-filtered, pressure lubricated power train.*

CATERPILLAR

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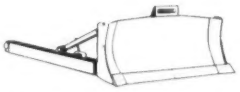
NEW PRODUCTS

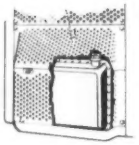
matched to the New D8 Series H

We have a complete selection of equipment to help you take full advantage of the extra workability of the new Cat D8 Tractor. Each machine or tool is designed to match the strength and ruggedness of the D8. Let us help you analyze your machine requirements, recommend the equipment needed for the job, and stand behind the complete unit.

NEW BULLDOZERS

Straight, Angle and "U-Type" Dozers.



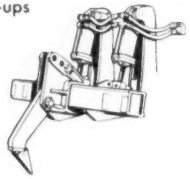


NEW HYDRAULIC SYSTEMS-NOS. 176, 165, 143

3 brand new hydraulic systems provide extra-large capacity and a combination of hook-ups never available before.

NEW NO. 8 RIPPER

Integral-mounted ripper features a 5-position clevis, designed for deep ripping. Hydraulically actuated, it can utilize the weight of the tractor to hold it at any working depth.



There is also a wide range of other equipment designed especially for the D8, including Fleco Rakes and Stumpers, Hyster Winches and Hystaways, Rome K/G Clearing Blade, Ulrich Spreaders, and many others. Call us today for complete details.

SEND COUPON FOR MORE INFORMATION

Send to your Caterpillar Dealer or Caterpillar Tractor Co., Dept. 18, Peoria, Ill.

I'd like more information on the new D8. Send to:

Name_____

Address_____

City_____ State_____

See the new D8 Series H at your

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CM-8V

Automatic Control of Mining Machines

by
GERALD VON STROH
Mining Development Committee, Bituminous Coal Research, Inc.

● One of the problems of research organizations is to bridge the gap between the future toward which the research organization must work and the practical problems of today.

For example,it is somewhat ridiculous to talk about jet mining machines with a 20 ton per minute capability when in good conscience, the practical operating executive wouldn't know what to do with such a machine today if he had it.

In somewhat the same vein but only on a lesser scale, an automatic mining machine does not have too much appeal.

It doesn't require a genius to determine that the capacity of present manually controlled machines does not limit production. It is the rest of the system that bogs down.

These other elements of the system are:

1. Roof Support
2. Face Transportation
3. Ventilation
4. Maintenance

Their order of importance will vary somewhat but substantial improvement in all of these areas must be realized before automatic mining machines or its little brother, remote control has any great significance.

So before considering the technical problems and benefits of automatic controls, let us see how near we are to any real improvement in the areas mentioned.

ROOF SUPPORT:

The mining development committee's recoverable roof support system, not a universal cure-all, but applicable in many coal mines. It consists of a beam as good or better than a 5 x 7 header with two nested jacklegs. These beams can be installed by two men in one minute and with the machine in place. These beams will become commercially available in February or March, 1959. They will permit a rate of advance of four feet a minute or about ten tons a minute, substantially better than any commercially available manually controlled mining machine. Nor is roof infusion to be ignored.

FACE TRANSPORTATION:

The mining development committee's transfer or boom conveyor, at present in scale model form. This conveyor has its own idler system. Retracts to 25 feet and can extend to 100 feet by a simple push button control. The full scale unit will probably be complete in the early spring of 1959. It will be 36 inches wide and competent to handle ten tons per minute or better. Two of these units along with a conventional extensible belt will provide continuous transportation for any two or three heading system. The units can be retracted and extended at better than 150 feet a minute.

Therefore, they should not retard the movement of the mining machine from place to place or in getting back out from under bad roof. The J & L Corner units also offer an excellent possible solution.

VENTILATION:

Several interesting developments appear promising. For example, foam for dust suppression and/or a replacement for rock dust at the working place.

The present generator has indicated that foam can effectively suppress dust. Proper compounding of the foaming agent will permit a 2 to 4 inch layer to remain on the ribs and roof for a period of one month or more. At present the generator is to be taken to the Bruceton experimental station for further evaluation. We all know that the elimination of dust will greatly simplify ventilation. The remaining major problem of this project, distribution of the foam, should be solved during 1959.

The work being done by the bureau of auxiliary blowers at the face and with dust collectors, is fairly close to commercialization.

The newest element of ventilation, which may prove useful, is work being done by the mining development committee on self advancing "line brattice," utilizing an expendable plastic sheet. If this proves practical, it can be commercially available within twelve months.

This leaves maintenance, which will be highly benefited by automation.

However, as long as the previous items cause a high degree of intermittent operation, it is likely that we will continue to push or crowd machines as we have done with cutting and loading machines for as long as they have existed.

A modern automobile has a 100 mile per hour capability. A new car averaging 100 miles per hour between Pittsburgh and Chicago on the turnpike would be almost completely worn out by the time it reached Chicago, if it lasted that long. Yet the same automobile will run with essentially no maintenance for 50,000 miles.

Poor operating habits, such as top speeds over rough roads will increase maintenance and shorten the life of a car. Getting into the top or bottom is the equivalent of a rough road, only more so.

This automatically means lost production, the machine is usually worked to its limit to get out of the top or bottom.

The obvious solution is to minimize getting into top or bottom and if you do, taking your time getting out.

Automatic controls would assure that the machine never took more than $\frac{1}{4}$ inch of bottom or left more than $\frac{1}{4}$ inch of coal. No human operator could possibly approach that quality of operation.

Mining machines with a 3, 5, or 20 ton per minute capability will not live very long at full throttle. We feel safe in saying, categorically, a machine cannot be designed to operate at its full capability for an extended period of time and still live. The designer whether of an automobile or of a mining machine designs the higher capability as a margin of safety and to handle unusual conditions for a short period of time. We certainly feel that a 20 ton per minute machine, presuming no interruption, should not be operated at average rates greater than eight tons a minute, which would still be 3,200 tons a shift.

Before considering the detail of automation, it would be well to differentiate between remote control and automatic or semi-automatic control.

Generally speaking, you must have remote control before you can attain automatic control. In the case of remote control the operator must constantly *observe, evaluate, make decisions and act.* In the case of automatic control, the operator is only required to act when the machine meets conditions outside of the range of its automatic functions.

For example an automatic machine could be designed to follow the floor. In most coal mines, almost indefinitely. However, the automatic control for seam height variation would of course become confused if the seam becomes too thin for the machine. Under these conditions the machine would by itself stop and signal lights would tell the operator why the machine had stopped. He would then decide whether or not to override the automatic controls and go ahead as he probably would in the case of a local roll, of, if in his opinion the machine had encountered a fault, he might pull out and start a new place.

The principal reasons for using automation are as follows:

1. Greater return or productivity per unit of investment.
2. Improved quality of product.
3. Increased safety for both machine and operator.

Within the limits designed into the system, the automatic system will perform these functions indefinitely and better than a human being for the following reasons.

1. Human responses are based upon a chemical, mechanical relationship with a definite limit on the speed of response.
2. The human being gets tired and bored. The automatic device does neither although it can be affected by short circuits and poor power supplies.

Earlier, we pointed out that several developments nearing completion should result in the mining machine itself becoming the major bottleneck. As this develops, automation of the mining machine will become economically feasible.

We should point out that an automatic pilot for a mining machine will probably cost in the order of $40,000.00 to $50,000.00 per machine. It would require about 10,000 additional tons per year per machine or about a five percent increase in productivity for the autopilot to be economically practical, certainly, not an impossible target.

Automation always starts with intelligence. Usually, but not always transmitted electrically. For a machine to follow the floor automatically, requires a device that can differentiate between rock and coal. There are probably ten different methods that could be employed. Fortunately, for most coal mines the difference in conductivity between rock and coal is about five to one, with the rock having the higher conductivity.

Therefore, two simple hardened steel insulated buttons in contact with the bottom can indicate whether they are in contact with coal or rock. The simplest type of electronic circuit then operates a solenoid valve to cause the machine to go up or down.

This illustrates the basic reguirement for automation. Each function to be automated must have the following:

1. A sensing device such as the steel probes.
2. A means to convert the electrical energy from the probes into a control action. This is usually called a computer.
3. A servo valve or its equivalent which mechanically causes the machine to alter its operation, i.e., go up or down.

Meeting these requirements eliminates the need for constant human attention and therefore differs from remote control. To meet coal mining conditions, the computer must also give a visual and audible alarm whenever the machine meets conditions outside of the range of its automatic functions such as the seam getting thinner than the range of the machine.

Maintenance will automatically be reduced with automatic operation by controlling the machine within its inherent limitations. Further development of the jet miner will eliminate much of the heavy gearing and hydraulic equipment used on present machines. Automatic controls will reduce the rate of advance in hard conditions and speed the advance in easy conditions.

Automation will not come forth with the blaring of bugles. It will develop almost unnoticed. This can be dangerous. A mistake in the orientation, equipment or ventilation of a hand loaded section was not very serious. The same mistake at $40.00 a minute can be disastrous.

A more specific example is the problem confronting the strip mining portion of our industry. To buy a three and one half million dollar shovel or to plan some other form of mining. Automatic and remote control of mining is rapidly becoming an established fact with very promising results being achieved in

(Continued on Page 32)

Splicing High Voltage Cables In Mine Service

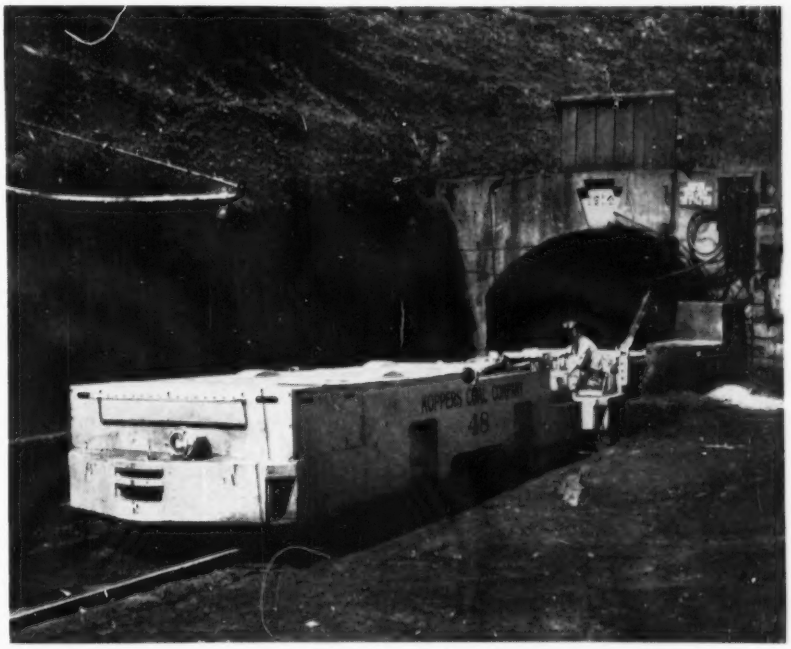
● For many of us the introduction of electricity in underground operations in large volume meant the learning of new techniques to keep up with the advancing science. We had been sort of on speaking terms with electricity as it came initially to light the surface buildings of the operation, plus our homes.

That was the day of straight lighting loads only for the manufacturers had not developed the appliances that flood the market today. A small beginning was made when the ¼ HP split phase motor was installed at the base of the old, wood tube with oscillating dolly type agitator to do the family washing. Not much later came the washer with the wringer also electrically powered and another big step was made in emancipating the housewife. The carpet sweeper gave way to the vacuum sweeper and the "hole shooter" type electric motor for the shop mechanic took a load off his back. A pair of #8 wires was sufficient in capacity to light and power the average house and the two family unit might have 3-#6's installed to split the load between them. 100 ampere services for homes were not even dreamed of. That size service was assumed just right for the large shop or store.

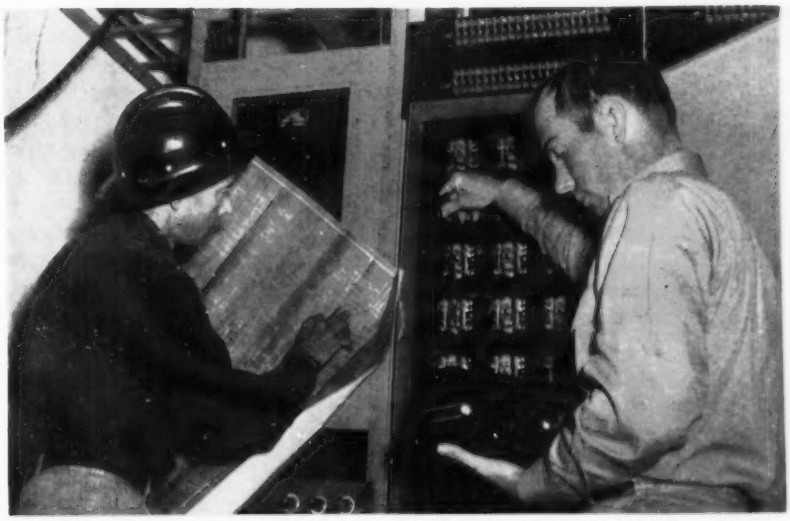
In mining circles the first step forward to utilize electricity in large increments was the introduction of electric traction, taking a leaf out of the street railway mans book.

Some of us used the rotary convertor and learned the hard way that it has certain peculiarities that must be conquered or trouble rests at your door.

Others made use of the less troublesome motor-generator sets that ran on and on for years before the slightest sign of difficulty showed up. Of course, when we needed more "soup" we often coupled the two units in parallel and then the fun began when some less informed person took over to balance the load between them on



First class equipment powered by ample sized conductors and rectifiers and well maintained!



The modern Mine employs the best in communication systems — machine switching or automatic telephone centrals.

weekends or as a pinch hitter for the regular operator.

Lightning was the worst curse we had to contend in a day of poorly built lightning arresters, or none at all. The philosophy in those days was to place a lot of faith in a set of choke coils ahead of the high tension side of the transformer bank. One hardly sees them any more in this modern day. The better arrestors have written them off the books. Then too we used to stretch a static wire overhead in the prayerful hope that the lightning must strike and be deflected to ground to save our precious equipment.

Our electrical education was not without the benefit of some outside help in the form of the manufacturers field engineer who stayed with us all through the installation to get the equipment on "line." Then too when really serious burnouts hit us the same factory service was pressed into yeoman service to get the repairs made on a round-the-clock basis with only snacks permitted to tide over the bone weary workers.

Some big operators provided night courses that were most beneficial and others of us attended vocational schools or contracted for the correspondence courses that were offered by many firms. Some good, some not so good. Those courses coupled with a lot of hard-won experience managed to keep us reasonably abreast of the situation as new fangled devices arrived.

High Voltage Problems Multiplied

With the mines increasing in size and depth high voltage went underground to power the pumps, fans and the modern source of dc — the mercury arc rectifier supplying "juice" for the traction systems.

We had gained some knowledge of the art of installing armoured power cables when the traction system went in some 40 years ago. Thus it was no new problem to handle the high voltage cables, plus the armoured communication cable that followed in short order to replace the loose wires pulled into conduit.

The stunt was managed by dint of setting a skip aside on the surface, uncoupling its 1¼ in. hoist rope, and using it as a means for lowering the power cable down the utility compartment alongside of the ladderway. The cable end was fastened to the hoist rope end and taped up well to facilitate handling by a man guiding the two down the shaft. Then at 50 ft. intervals strap clamps were used to tie the two together as a common unit.

When the full 3000 ft. was paid off the reel some 600 ft. was coiled at the shaft collar with eventual laying in the transit conduit to the hoist and power house left as the final phase of the work.

Each clamp was then taken off of the hoist rope and fastened to the shaft steel for the permanent suspension with the lower terminal brought into the pump room.

The First Cable Tap

Years later a decision to utilize a large spring for the community water supply was made. This was located on the 600 ft. level, some 800 ft. from the shaft.

The bank of three-25KVA transformers was placed in a concrete vault and preparations laid to tap the shaft cable on a holiday when shaft traffic was not a hazard.

Figure 1. indicates how the armor was carefully sawed through with a hack-saw at two points, then carefully turned back to provide a good, smooth opening for the splice to be made with ample room for the use of tools and final taping operation. All went well at this phase of the work until the rubber covered conductors were exposed to view. They proved to be under such terriffic tension as to render it impossible to separate them for insertion of the "Burndey" split, type T connectors.

There remained but one alternative, make use of a large differential hoist to develop a strain on the cable below the splice to develop slack sufficient to spread the conductors. Some 500 ft. of cable was unclamped from the shaft steel to achieve the desired amount of slack. Then the clamps were refastened.

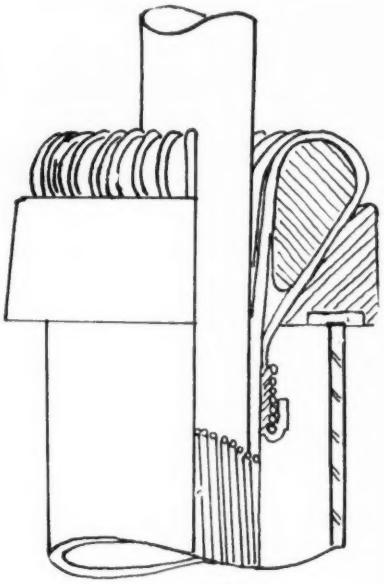


Fig. 1.

The splicing now went according to plans and the tape was carefully applied over the three staggered connectors. The "boot" type of cast iron splice box in two halves (Figure 2.) was carefully positioned over the tap and the upper ¾ in. plug removed for the purpose of pouring in the compound. This was heated in a bucket on a gasoline fired plumber's furnace while the final work was being concluded on the cast iron box. Lacking a thermometer the temperature was guessed at. There we developed our second mistake as events proved.

The heated compound was poured in slowly to permit it to flow all

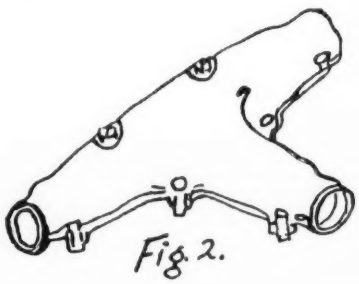
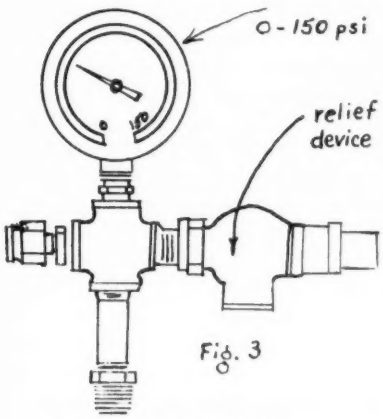


Fig. 2.

around the interior parts to dissipate all the air bubbles and moisture and contract a little before the final measure was poured in and the plug replaced. Pressure pumps for placing compound were unheard of in those days. These have the ability to force compound into all the voids, to expell the air and moisture, plus developing a more homogeneous mass that will not develop contraction cracks for moisture to enter in later years.



Pressure testing assembly for compound pouring.

(Figure 3.) When the box was cooled to the temparature of the surrounding air it was deemed safe to apply the 2,300 volts of a c power. Luckily the telephone was at a safe distance from the splice operation for the cast iron box erupted as if loaded with black powder and not even a fragment remained in place.

It being too late in the day to attempt a second splice rubber bandages were carefully wrapped about the undamaged cable opening and the job was left for a second try on some other holiday.

Having learned the hard way that overheated compound has serious deteriorating affect on insulating tapes we brought a thermometer down for the next attempt and since we had no slack developing problems on the second occasion more time was available for cooling the splice for an additional four hours. It is still functioning to produce crystal clear water by means of the automatic pump located at the spring of the long worked out area of the 600 ft. level. The safe temperature for pouring compound is at an average of 107 to 225 degrees for summer pouring, with 149 to 300 degrees F. being the average for winter jouring. Temperatures do vary for the various brands sold today.

Fiasco No. 2.

At a branch mine the armored cable had been salvaged from an abandoned operation and hung in a new fire-proof shaft served from the same hoist-power house combination. Sombody erred in calculating the number of turns to lay aside to reach from the shaft collar to the power house bus bar.

The shortage of 150 ft. was made up from a salvage length of armored "submarine cable" to piece out what was lacking in the original section.

Having no previous experience with the art of splicing high tension cable for underground service, or that to be buried on surface, the men made up a neat, staggered splice using the popular "jack knife" type Burndey brass splice devices that fold into a smooth, barrel like tube. Ample turns of the then very popular varnish cambric tape were applied to each joint and followed with the protective coating of numerous layers of friction tape.

A stout wood box was provided by the carpenter shop and U shaped cuts were made in each end to permit entry of the cable. With slots well sealed, the compound was poured in and well cooled to allow for shrinkage. Then a final pour was made and the cover screwed down over the still glutinous mass. A liberal coating of compound was applied to the exterior of the box for additional protection against rot and the infiltration of water.

Many years later in the dead of winter with the ground frozen down some four ft. the cable failed on all three conductors. What a debacle that turned out to be! The chief electrician was in a hospital hundreds of miles away and no one deemed it necessary to phone him for suggestions on where the break might be found. Other old timers had long ago left the payroll. Frantic digging ensued all night long while a wheatstone bridge was brought from the city to analyze the open spot on the cable. With water beginning to over-flow the pump's reserve sump the break was dug up at last. Of course, you the reader knows the location at the Rube Goldberg splice, of course! The long years of exposure to the elements, even though buried by 3 ft. of soil had proved too much for the poorly developed splice since the wood had rotted away to expose the vulnerable compound and to all the hazards of heat and cold, moisture and contraction and expansion factors. To top off the comedy of errors no engineering record had been made to indicate time, place and location of the cable and its vulnerable splice. Lacking such information newer managements had rerouted a company road to place the ditch right over the splice box. A bit more bulldozer energy might have ripped it up during the road relocation work!

A Serviceable High Tension Cable Splice

Since but few operators employ a mechanic familiar with all the intricacies of the lead wiping technique it behooves the management to seek a suitable substitute for the "wiped joint" and see to its proper installation at all times. *Fig. 4* illustrates the device that has served most of the smaller operators for many years without serious faulting that could be charged to the assembly or the design of the splice.

This joint production box is classed as the submarine type but we have not used it for submarine work as yet. It is well adapted to buried installations. The box consists of a steel pipe to suit the length of the joint, cast iron pipe reducers and split cast iron armor clamps, the latter bored to fit over

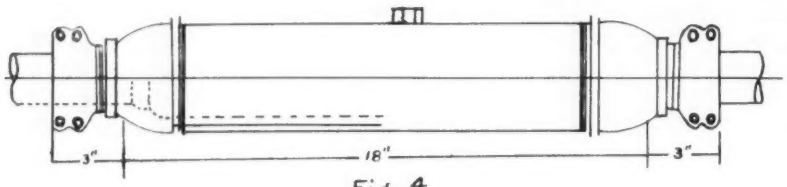


Fig. 4

the cable armor or sheath, bolted together and threaded into the reducers. If to be filled with compound under pressure to detect leaks and to fill all voids a taped plug hole is provided. For short term installations, not too seriously exposed to moisture the box is used without sealing it with compound.

For buried service it recommended that the box be encased in vibrated concrete with approximately 3 in. wall and coated with several applications of hot tar to render it water resistant and to offer protection against mechanical damage if buried in comparatively shallow ground.

Skill is the Key Note to Splicing!

Skill is vital in making splices. Once the splicer is provided with the proper tools, tapes, compounds and boxes, his skill is the remaining necessary ingredients. Jointing ing instructions that are furnished with the box are helpful as supplements but a background of experience is most valuable.

If much splicing is in sight its best to set up a school for the initial training rather than leave things to chance as was described in the opening remarks of this article. It frequently happens that the splicer has had low voltage experience but must be brought up-to-date on the much more precise work required on high tension cables. Paying attention to details and following instructions often makes up, to a large extent, for lack of experience. His training will indicate to him the key points that differ in the new work assignments.

The Shielding Problem.

Communications and low voltage work can provide the early experience for cable splicing and as one moves up the new problems are met, one by one.

To those not accustomed to making joints for shielded cable everyday, a note of caution is in order: the shielding must be applied to the joint in a good workmanlike manner in accordance with the best techniques. Failure to do so invites early and expensive trouble. The same is true of stress cones. Be sure the shielding is grounded, either in the cable or in the joint, at one or preferably two points.

Stress Relief Cones

Stress relief cones are built up over the hand wrapped insulation in a staight-line contour with plain or tinned copper-mesh tape as the case may be, furnished for the purpose. The stress relief cone must be permanently, physically, and electrically connected to the shielding of the cable, usually by soldering. For shielded-type and lead-covered cables rated at 8 kv and higher, grounded neutral, apply stress-relief cones as in *Figure 5* using varnished cambric tape and copper mesh tape spot soldered, and soldered to shielding tapes.

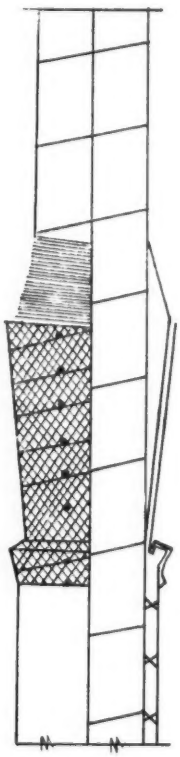


Fig. 5

The purpose of stress-relief is to relieve the voltage stress concentration in the factory insulation in each of the cables to be joined especially when they are covered with a grounding conducting layer as in lead sheath, shielding tape or such semiconducting tape as rubber or carbon black paper. At low voltage rating and when belted type cables are joined; when stress-relief cones are unnecessary, the additional hand-wrapped insulation, A provides for the stress-relief. In all other single or multi-conductor lead-covered or shield-type cables, the stress relief cone carries conducting mesh or other tape up to its outer enlarged diameter so that the terminus of grounded layer is at that point when it is terminated there. In most cases, the shielding is applied across the joint, continuous between stress-relief cones; so the ground layer is also continuous.

Type CB Cables

The difference from standard cables is that a conducting carbon-black tape is wrapped over the insulation and must be removed according to the instructions packed with the cable. The difference from standard cables is small and simple but cannot be ignored or troubles will ensue.

These points must be kept in mind:

1. Always consider carbon-black tapes in the same way as you would a conducting metallic tape.

2. Always remove carbon-black tapes back to the point where a stress-relief cone is started, or where the hand wrapped tapes are applied, as the instructions will show.

(To be continued in March issue of Modern Mining)

● The recent introduction of the Caterpillar Series H D8 direct drive and torque converter Tractors brought about the need for a complete new line of matched tools. These tools, characterized by strength and durability to match the new tractors' increased output, were made available concurrently with the introduction of the Series H D8.

Included among the new line of matched equipment is a complete new family of bulldozers. All three new model blades — straight, angling, and "U" dozer — have been designed for greater production, longer life, and increased ease of servicing and transporting.

The new 8S Bulldozer has a modified U-shaped blade. The use of this configuration was prompted by the success experienced by similar design on the No, 9S Bulldozer. This design allows handling of bigger loads because of the reduced end spillage due to angled end sections. Also, on sidehill cuts, these angled end sections cut and cast material to the center of the blade.

The new No. 8S Bulldozer is 9½ inches longer than its predecessor. The back of the new blade is fully enclosed, which provides additional blade strength. Increased blade rigidity is accompished by the inclusion of longer diagonal braces. A two-piece cutting edge is standard on the new blade, making one-man reversal or replacement of the cutting edge easier.

Improvements on the No. 8A Bulldozer include a two-piece C-frame, which can be easily assembled or disassembled to overcome possible size restrictions when shipping. The new blade is 18″ longer than the previous model, and has stronger basic construction and blade braces.

The new No. 8U Bulldozer, with an 18″ increase in length and 6⅜″ increase in height, also incorporates the new operating and service features of the No. 8A and No. 8S Bulldozers. In addition, gussets have been added to support the cutting edge base, to give this critical area maximum strength.

A new No. 8 Ripper, incorporating a "5-position" clevis and tooth has also been made available for use on the Cat D8 Series H. Tractor. The prime production feature of this new, more durable unit is its ability to more closely match ripping angles to varying materials.. The mechanical components which make this possible are a redesigned clevis with three tooth-positioning holes, and a tooth which provides a "high" and "low" position. This segment of the new design provides the correct angle of entry at ground level for quick penetration. At desired ripping depth, a smaller tooth angle than at entry achieves the planning and lifting action required for high performance in all materials.

Since many of the toughest operations are performed at shallow ripping depths, the new design allows for a more efficient tooth angle at shallow depths.

In addition to design, the clevis has been changed structurally. For merly made as a welded fabrication, the new clevis is now manufactured as a steel casting, and is made of alloy steel over twice as strong as the previous fabricated clevis.

A kick-out mechanism, similar to that used on the current No. 9 Ripper, has also been incorporated into the new No. 8 Ripper. This device automatically returns the hydraulic control lever to "hold" position when the hydraulic ram approaches its maximum limit during raising or lowering operations. This feature is intended to increase operator efficiency in addition to decreasing wear due to bottoming of the hydraulic piston and actuation of the hydraulic control relief valve.

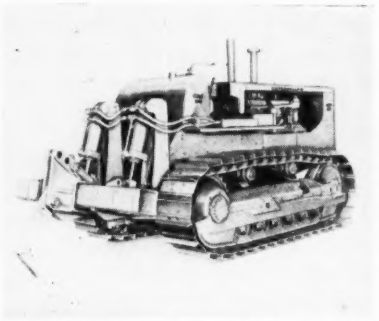
Bore of the ripper cylinder has been increased from 7¼" to 8¼" to provide lower working hydraulic pressures and greater reserve capacity.

To operate the new line-up of D8 tools, three new hydraulic controls have also been introduced — the No. 176, No. 165 and No. 143 Hydraulic Controls. The most notable feature of these units, in addition to their increased size and capacity, is the flexibility of arrangements they offer. The No. 176 Control, for example, can replace the No. 46 Hydraulic Control for bulldozer operation, and, at the same time, replace the No. 48 Hydraulic Control in operating the ripper and tilt cylinder by the addition of fender-mounted auxiliary valves. This versatility feature eliminates the need for purchasing a separate complete control unit for ripper and tilt cylinder service.

The No. 165 Control replaces the previous No. 48 Hydraulic Control in actuating the ripper and tilt cylinder; and the new No. 143 Control replaces the No. 44 Hydraulic Control for tilt cylinder operation. Since both of these controls are driven from the rear of the engine by the auxiliary drive, both the front and rear of the tractor are free for other equipment.

Increased power and higher response speeds are characteristic of these new controls. For instance, when the new No. 176 Hydraulic Control is used in ripper operation, higher ripping speeds are obtained because of the unit's 100 GPM pump. The No. 48 Control — formerly used on the No. 8 Ripper — had a pump capacity of 42 GPM. Faster ripper speed is also available from the new No. 165 Hydraulic Control, resulting from its 66 GPM pump capacity.

More hydraulic horsepower has been made available when operating the dozer and ripper with the No. 176. This has been accomplished by a relief valve setting of 1500 psi, as compared to a valve setting of 1075-1150 psi on the No. 46 Control. This feature provides for more positive action of blades, ripper and tilt cylinder when operating in highly resistant material.



In order to reduce servicing, all track rollers, track carrier rollers and idlers on the new Caterpiller Series H D8 Tractors make use of metal-to-metal sealing surfaces which assure lifetime lubrication. These components are lubricated at the factory and require no further lubrication until rebuilding.

The new Caterpillar Series H D8 Tractor is matched in work-capacity by a new No. 8 Ripper. This more durable tool has been designed with the ability to closely match ripping angles to varying materials through the use of a redesigned "5-position" clevis. This feature provides the correct penetration and ripping angles.

Nearing completion north of Peoria at Mossville, Illinois is the new Caterpillar Tractor Co. Industrial Engine Plant. Built on a 1200 acre site the plant will add 470,800 square feet under roof to Caterpillar's facilities for production of diesel engines. Engine Division offices will occupy another 88,000 square feet. Production at the new plant is expected to begin in the summer of 1959.

Lima 2400 removing overburden at C & K Coal Co., Parker, Pa.

● A new line of portable rotary air compressors, featuring "Perma-Vane" rotor blades, is announced by Davey Compressor Co., Kent, Ohio.

Of special solid, lightweight material, Perma-Vane blades are said to have greater wear resistance than those used in most rotary machines. Davey has applied for a patent on both blade design and material. It is further claimed that Perma-Vane blades, due to freedom from deterioration and breakage prevent serious compressor damage and assure longer, more efficient life. Their light weight and minimum friction are also reputed to reduce horsepower required by the compresor and to afford important operating economies. Blades move continuously in a straight line from the stator center. They cannot cock or bind.

The new line, offered under the tradename Davey Hydrovan Rotary, includes portable compressors of 125 to 600 c.f.m. capacities.

Davey Hydrovane Rotary Model 125

In operation the new rotary units are claimed to achieve volumetric efficiencies up to 92 percent. The compressors are likewise, said to have 50 percent fewer working parts than others of the same capacity. Units are designed to deliver air at 100 degrees above ambient temperature.

For complete specifications, write Davey Compressor Co., Kent, Ohio.

● *How To Get The Most Out Of Shovel-Cranes With Torque Converters* is the title of a new 16-page booklet just issued by Link-Belt Speeder Corporation of Cedar Rapids, Iowa, manufacturer of power shovels and cranes.

Since the torque converter in shovel-crane applications is relatively new, the purpose of this illustrated booklet is to offer tips that will assist an operator in getting greater production with less effort from a machine equipped with an engine-converter combination. Prefacing the tips on operation and maintenance is an introductory explanation of what torque is and how it applies to shovel-cranes. Immediately following is a comparison of performance differences between torque converters and fluid couplings.

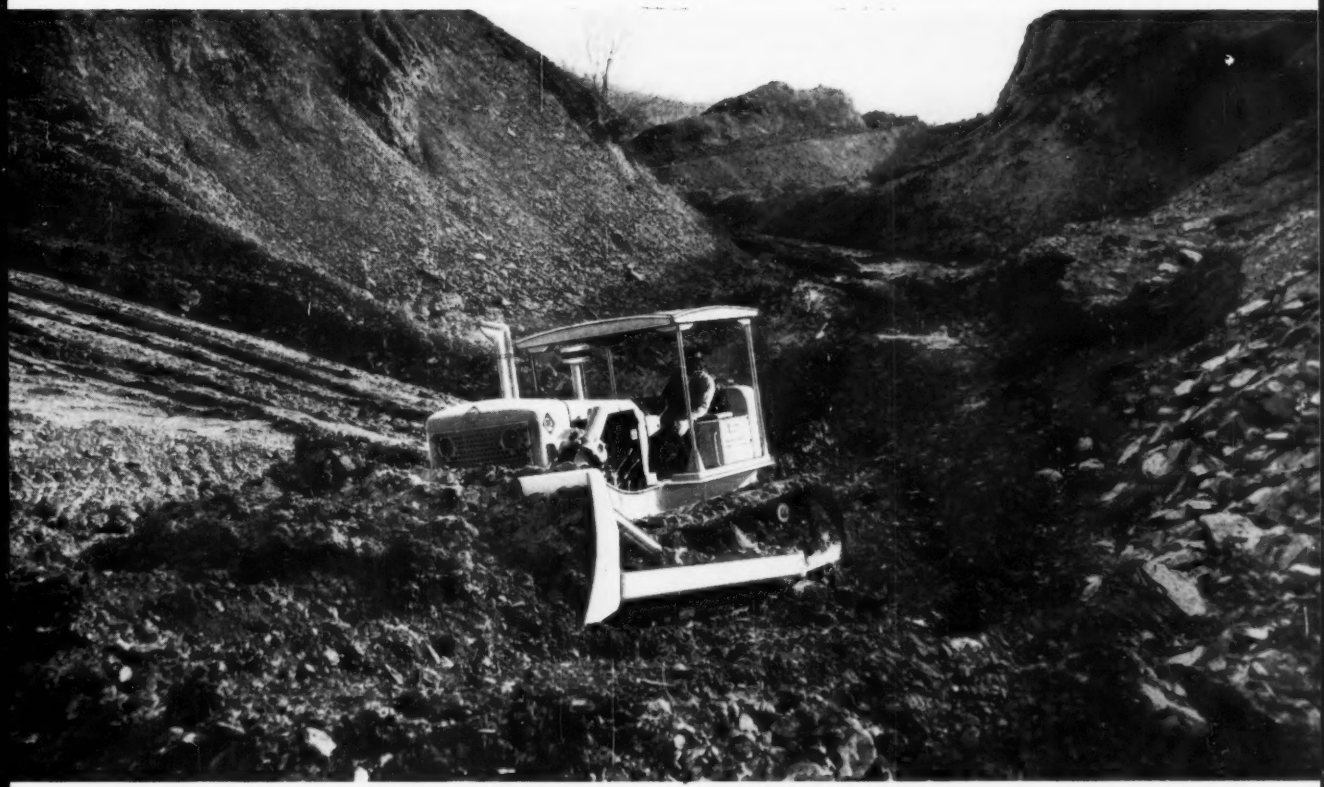
Written in non-technical language, its contents are basically fundamental and as such, this operator's handbook is generally applicable to other than just Link-Belt Speeder shovel-cranes.

Copies can be obtained from Link-Belt Speeder distributors or by writing direct to Link-Belt Speeder Corporation, Cedar Rapids, Iowa. Ask for Book 2740.

● **Catalog 930**—96-page book covers Jeffrey line of electric vibrating feeders and conveyors. Controls, installation methods, principles of operation and individual unit specifications are included. Other vibrating equipment such as barrel packers and coolers and dryers as well as magnetic separators and bin level indicators are covered in this extensive catalog. Photographs, line drawings and installation views support the detailed exposition.

Coal Crusher Bulletins—Just released five new bulletins covering types of reduction machinery for coal, alum, bones, salt and chemicals. **Bulletins 937** and **939,** four pages, each, cover single roll crushers and flextooth crushers respectively. **Bulletin 938,** four pages, deals with Jeffrey's single roll stokerkol sizer which employs a special segment designed for the production of premium size stoker coals, **Bulletin 940,** four pages, cover the flexroll coal crusher for reducing small capacities of coal to stoker sizes. A two page leaflet, **No. 949,** describes the heavy duty slugger crusher for reducing large size rock and mine refuse.

Perry-Ross Coal Co. maintains production schedules with **Allis-Chalmers HD-21s**



HD-21s strip, fill, build access roads . . . no job is too tough.

◀ Ability to push bigger loads is outstanding HD-21 feature.

No job is too tough for the Allis-Chalmers HD-21s at Perry-Ross Coal Co., Harlansburg.

And—that's why more and more leading Pennsylvania mines are now standardizing on A-C equipment . . . sold, serviced, guaranteed by Highway!

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HIGHWAY EQUIPMENT COMPANY

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40 Hoover Ave. • Du Bois, Pa.

size rock and mine refuse.

PROGRESS OF HYDRAULIC MINING IN RUSSIA

(Continued from Page 9)

Production Methods and Capital Investment

One of the most important advantages of hydraulic mining is that is a single-operation system which can be carried on continuously. Since a single-operation process of extraction ensures the automatic "renewal" of the working face, the intensity of extraction from each square metre of face rises sharply. The length of face is therefore immaterial and the short face becomes a production unit with a high and constant o.m.s. both for mining and transport workers. The only factors to be considered in determining the method of working are the non-productive elements i.e., the labour for roof support, removal of equipment, material supply and so on.

Hydraulic winning and transport has the following advantages: No tubs are used and there is no need to lay out level roadways; pit-bottom layouts are simplified; shafts are smaller than are required for conventional mineral hoisting and winders are required only for men and minerals; by hydraulic transport it is possible to convey coal from several nearby collieries to central preparation plants. The result is a marked reduction in the capital investment required for underground development, shaft equipment, and surface structures, which enable smaller reserves of coal to be worked than would be possible with, for example, a mine employing locomotive haulage and skip winding. These factors have led to certain trends in development of hydraulically worked collieries, including use of inclined shafts or drifts. For deep seams, however, vertical shafts may be required.

Regarding the rate of production it is stated that at present an output per seam of 1,000 to 2,000 tons per day can be considered efficient depending on the seam thickness, but for seams 5 to 7m. thick in flat or moderately inclined measures the output can reach 3,000 to 4,000 tons/day.

Trials with long-hole pulsed infusion shotfiring were carried out at one colliery, a seam being worked in 50 ft., pillars and shotholes, using a de-concentrated charge and water stemming. This method was found to be three to four times more effective than the usual practice.

IT'S PERPETUAL MOTION

The reason we can always sell adequate and immediate supply of the BEST in Mining Equipment at BARGAIN prices is because we are always ready to buy any quantity offered us at any time.

(We are at present dismantling four large mines with modern equipment and complete cleaning plant.)

The reason we are always in the market to buy at fair prices the year round is because we have developed markets for continuous sales at reasonable prices.

Want to Buy? Want to Sell? Call J. T. FISH WE OWN WHAT WE ADVERTISE

JOY EQUIPMENT—REBUILT

3—Joy 14BU Loader, low pedestal, 7AE.
2—Joy 14BU Loaders, medium pedestal, 7RBE.
1—Joy 14BU Loader, high pedestal, 7BE.
6—12BU10E Joy Loaders complete with Piggy Backs.
2—Joy 12BU Loaders, 9E, latest type.
1—Joy 12BU Loaders, 220 volt AC.
1—Joy 20BU Loader, latest type.
1—Joy 11BU Loader, latest type.
2—Joy 8BU Loaders, 250 volt DC.
1—Joy 8BU Loaders, 34" overall height.
2—Joy 8BU Loaders. 220 volt AC.
1—Joy curved Bar Head, complete.
4—Reliance 38-J Motors.
6—Reliance 24-J Motors, 7½ H.P.
4—Reliance 10-J Motors, 5 H.P.
3—Reliance 15-J Motors, 7½ H.P.
20—9-J Motors, 4 H.P.
6—New Wheel Units for Joy 6SC Shuttle Cars.
1—Goodman 660 Loader on cats, excellent.
1—Goodman 665 Loader on cats, latest type.
1—Goodman 865 Loader, 26" high.
2—Joy 8SC Shuttle Cars, rebuilt.
2—Joy 6SC Shuttle Cars, rebuilt.
2—Joy 5SC Shuttle Cars, rebuilt.
2—Joy 32E9 Shuttle Cars.
2—Joy 32E10 Shuttle Cars, rebuilt.
2—Joy 32E15 Shuttle Cars, rebuilt.
1—Joy 32E16 Shuttle Cars, rebuilt.
2—Joy 42E16 Shuttle Cars, rebuilt.
8—Small rubber tired Shuttle Cars.
3—Low Vein Rubber Tired Tractors.
3—Joy CD-22 Drills, like new.
4—Joy T-2-5 low pan Cat Trucks.
1—Joy T-2-6 low pan Cat Truck with reel.
2—Joy T-1 Standard Cat Trucks, 220 AC.
1—Joy T-1 Standard Cat Truck, 250 DC.
2—Joy 11-B Cutting Machines, like new.
1—Joy 7-B Cutting Machine, like new, 250 volt DC.
2—Goodman 212 Cutting Machines, 19" high.
4—Goodman 312 Cutting Machines, 17" high.
3—Goodman 412 Cutting Machines, 19" high.
2—Joy 7-B Cutting Machines, 220/440 volt AC.
1—Goodman Machine on Cats, 31" high. All hydraulic.
6—Goodman 512 Machines with Bugdusters.
1—Goodman 512 Cutting Machine, perfect.
4—Goodman 512 Cutting Machines, 220/440 volt AC.
3—Goodman 112 Cutting Machines, 220/440 volt AC.
1—Lee Norse low vein Machine Carrier on rubber.
1—Jeffrey 70 URB rubber tired Cutter. Universal head, perfect condition.
1— Joy 10RU Rubber Tired Cutter, first class.
1—Joy 11RU Rubbber Tired Cutter, with bug-duster, Universal head, like new.
1—Sullivan 7AU on rubber.
2—Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on cats, 250 volt DC.

LOCOMOTIVES

1—Goodman 6 ton, 91-A, 27" high, armor plate frame
2—Jeffrey, 13 ton, type MH-110, 36" 42" and 44" Ga.
2—Jeffrey, 10 ton, type MH-110, 42" and 44" Ga.
1—Jeffrey MH-124, 6 ton, 24" overall height.
12—Jeffrey, 6 ton, type MH-88, 42", 44" and 48" Ga.
2—Jeffrey, 8 ton, type MH-100, 2" armor plate frames.
1—Jeffrey, 6 ton, type 2186, 22" above rail.
3—Jeffrey, 4 ton, type MH-96, 42" 44" and 48" Ga.
1—G.E., 4 ton, type 825 Locomotive, 22" high.
10—G.E., 6 ton, types 801, 803, 821 Locomotives, 42". 44" and 48" Ga.
1—G.E. 8 ton, type 822 Locomotive, 44" Ga.
3—G.E. 10 ton, type 809 Locomotive, 42", 44" 48" Ga.
2—Goodman, type 33, 6 ton, 44" and 48" Ga.
3—Goodman, 8 ton, type 32A, 36", 44" and 48" Ga.
3—Westinghouse, type 902, 4 ton, 42" and 48" Ga.
2—Westinghouse, type 904, 6 ton, 44" and 48" Ga.
2—Westinghouse, type 906, 44" and 48" Ga.
2—Westinghouse, type 907, 10 ton, 44" and 48" Ga.
8—Jeffrey MH-78 Locomotive Units, cheap.

Locomotives (Cont.)

3—Plymouth Diesel Locomotives, 8 and 10 tons, 42" and 44" Ga.
4—Jeffrey MH-88 Locomotive Units, real bargains.
6—Jeffrey MH-100 Locomotive Units, reasonable.
Locomotive Trucks and Spare Armatures for all the above.

TIPPLE EQUIPMENT

5—Complete Tipples, 3 to 5 track, steel and wood.
3—Cleaning Plants, 1 ea. McNally, Roberts and Shaffer, Jeffrey, Washers and Air-flo Tables.
1—Roberts and Shaeger tandem hydro-separator.
1—Allis Chalmers 5x14 Rippflo Vibrator.
1—Robbins 5x14 double deck Vibrator.
1—Robins Gyrex Vibrator 4x10.
Belt and Apron type Loading Booms. Shaker Screen.
1—Robins Car Shakeout.
10—Crushers, various sizes.
Feeders, Belt and Drag Conveyors, Car Retarders, etc.

CUTTING MACHINES

1—Joy 11RU, rubber tired, Cutter.
1—Joy 10RU, rubber tired, Cutter.
1—Jeffrey 70 URB Cutter, rubber tired, Universal Head, low vein.
2—Jeffrey 29UC Universal Machines on Cats.
1—7AU Sullivan on rubber.
1—Goodman on cats, 31" overall height.
3—Baby Goodman 212's, rebuilt, 250 volt DC.
2—Goodman 212 Cutting Machines, 19" high.
4—Goodman 312's, 17" high.
3—Goodm a 412 Cutting Machines, 19" high.
4—Goodman 312's Cutting Machines, 17" high.
6—Goodman 512's with Bugdusters, like new.
4—Goodman 512's, rebuilt, or as removed from service.
4—Goodman 512's, 220/440 volt AC.
3—Goodman 112's 220/440 volt AC.
2—Joy 7-B Cutting Machines, 220/440 volt AC
2—Joy 11-B Cutting Machines, rebuilt.
6—Goodman 12AA's and 112AA's, 250 volt DC.
2—Goodman 324 Slabbers.
2—Goodman 724 Slabbers.
6—Jeffrey 35L's, like new, 17" high.
2—Jeffrey 35L's on low vein trucks.
15—Jeffrey 35B's and 35BB's.
2—Jeffrey 29B's on track.
2—Jeffrey 29C's, track mounted.
2—Jeffrey 29L's on track, perfect.
3—Sullivan CE7, 220 volt AC.
2—Sullivan CR-10's, 15" high.

LOADING MACHINES

6—Joy 12BU with Piggy-Back Conveyors
16—Joy Loaders, all types.
1—Goodman 865 Loader, 26", on cats.
1—Goodman 665 Loader, on cats.
1—Goodman 660 Loader, on cats.
1—Goodman 460, rebuilt.
2—Jeffrey 61 C18's, on rubber, 26".
3—Jeffrey L-500 Loaders.
2—Myers Whaley No. 3 Automatic Loaders.
2—Clarkson Loaders, 26" above rail.

CONVEYORS

2—Joy 30" Underground Belt Conveyors, 500' to 2000' each. Excellent.
2—Goodman 97-C, 30" Conveyors, 1500' long.
1—Barber-Greene 30" Belt Conveyor, 350', Excellent.
1—Robin 30" Belt Conveyor, 500'.
1—Jeffrey 52-B, 26" Conveyor, 1200' each.
1—Jeffrey 52-B, 30" Drive and Tail Assembly, complete.
3—Robins 26" tandem drive Belt Conveyors, 1000' to 2000' long. Excellent condition.
2—Joy MTB 30" Drive and Tail Assembly, complete.
3—Goodman 97 HC 30" Drive and Tail Assemblies, complete.
8,000' Conveyor Belt, 30".
10,000' Conveyor Belt, 26", like new.
2—61EW Elevating Conveyors.
2—61WH 15" Room Conveyors, 300'.
2—Joy 15" Room Conveyors, 300'.
2—Joy 20" Conveyors, 300'.
4—Joy Ladel UN-17 Shakers.
10—Goodman G-12½ and G-15 Shakers.

CONVERTERS AND DIESEL PLANTS

2—100KW, G.E. TCC-6's, 275 volt, Rotary Converters
1—150KW, G.E. HCC-6, 275 volt, Rotary Converter.
1—150KW, 6 phase, Allis Chalmers Rotary Converter, 275 DC.
1—200KW Allis Chalmers Rotary Converter, 6 phase, 275 DC, perfect.
1—200 KW, G.E. HCC-6 Rotary Converter, 275 volt DC.
1—300KW, G. E. HCC-6 Rotary Converter, 275 DC.
2—300KW Westinghouse, 6 phase, Rotary Converters, 275 volt DC.
2—500KW Westinghouse Rotary Converters, 275 volt DC.
2—200KW Westinghouse Rotary Converters, 275 DC.
(all the above with 6900/13000 and/or 2300/4000 primary transformers)
2—150KW MG Set, General Electric and Westinghouse.
1—200 KW MG Set, Westinghouse, rebuit.
1—200KW MG Set, General Electric, perfect.
2—150KW Allis Chalmers MG Sets, 275 DC volt, excellent 220-440 AC volt.
1—300KW Westinghouse, 600 volt MG Set, rebuilt.
2—300 KW Westinghouse, 600 volt, 6 phase, Rotary Converters.
2—500KW Westinghouse, 600 volt, DC, 6 phase, Rotary Converters.
2—500KW HCC-6 Rotary Converters, 6 Phase, 600 volt DC.
1—GMC 471 Diesel with 60 KW, 250 volt DC Generator.
1—GMC-671 Diesel with 75 KW, 250 volt DC Generator.
1—Cummins 125 KW, Diesel with 250 volt DC Generator.
1—Allis Chalmers Natural Gas Engine with 100 KW Generator, 275 volt DC.
1—700 H.P. Shaft Hoist, complete.
Complete steam plant will sell all or any part.
Boilers, like new, 1100 H.P. and 500 H.P. Also transformers, turbines, etc.

MISCELLANEOUS

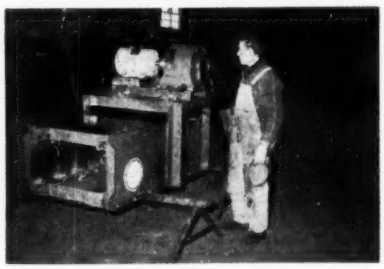
5—Complete Tipples, 3 to 5 Track. Wood and Steel.
20—Jeffrey Molveyors on rubber tires.
1—¾ Yard Shovel and Back-Hoe.
1—¾ Yard Crane on Cats.
Battery Supply Tractors, rubber tired.
1—Cantrell Air Compressor on rubber tires.
10—Air Compressors, 1 H.P. to 40 H.P.
2—Joy self propelled rubber tired compressors, 240 cu. ft.
2—Acme self propelled rubber tired compressors, 130 cu. ft.
40 Mine Pumps, all types.
1—Differential 40 Passenger Man Trip Car.
6—MSA Rock Dusters.
2—Phillips, Carriers, 44" and 48" Ga.
2—Barber Greene self-propelled Bucket Elevators.
Pipe, Plastic, Steel, Transit, all sizes 1" to 6".
100 Mine Cars, drop bottom, 42" Ga.
30 Mine Cars, drop bottom, 44" Ga.
100 Mine Cars, 18" high, end dump, 44" Ga.
300 Mine Cars, end dump and drop bottom, 20" high, 48" Ga.
1—10 ton Mine Car Scale with Recorder.
15—Brown Fayro HKL and HG Car Spotters.
1—12 ton Differential Slate Larry.
Incline Hoists, 25 to 50 H.P.
1—Jeffrey 5' Aerodyne Fan, like new.
1—Jeffrey 6' Aerodyne Fan.
1—Jeffrey 8' Aerodyne Fan.
2—Storage Tank, 4,000 Gallons.
1—Storage Tank, 10,000 Gallons.
10,000 Five Gallon G. I. Cans, screw lids.
2500 tons Relaying Rail, 25, 30, 40, 50, 60, 70, 80 #.
100 tons Copper — 4/0 and 9 Section Trolley 1/0, 2/0, 4/0 Stranded. 500 MCM and 1,000 MCM Feeder Cable.
Thousands of feet of rubber covered three conductor cable.
300 Transformers from 1 to 2,000 KVA, 110 to 13,000 primary volts.
400 Electric Motors, 3 to 250 H.P.
Huge stock of mine supplies.
Thousands of Other Items.
600—MSA Mine Lamps, Chargers, etc.
1— Fricke Saw Mill—Complete.

WE BUY—SELL—TRADE **J. T. FISH** **PHONE 2825, LOGAN, W. VA.**

ADVERTISER'S INDEX

FEBRUARY, 1959

● A new, low cost Flite Conveyor designed in prefabricated sections that can be installed to virtually any length or profile has been announced by The Daniels Company, Bluefield, W. Va. Innovations include a total enclosure which eliminates spillage, full flexibility of installation due to sectionalized design, ready adaption to all conveyor uses, unusually low cost resulting from standardized production, and availability in one week.



Daniels Type C Flite Conveyor

Known as the Daniels Type C Flite Conveyor, this machine is well suited to gathering, distribution, transfer, mixing, blending, bin discharge feeder and all other conventional conveyor applications. For special requirements, the Type C is also available with abrasion or corrosion resistant parts, rack and pinion discharge gates, and fluid drive. Standard drive is conventional electric motor and gear reducer. Individual sections are shipped assembled ready to be connected. Installation by the factory is available if desired. Shipments are guaranteed in one week from date of order. For further information write The Daniel Company, Bluefield, W. Va., or Indiana, Pa.

AUTOMATIC CONTROL OF MINING MACHINES

(Continued from Page 20)

the critical areas of mining machines, face transportation, supply handling, maintenance and roof support.

We suggest therefore, that you as individual coal operators, if you have not already done so, reconsider your organization in the light of things to come.

Our biggest problem is not in achieving the elements for automation. It is in getting busy coal executives to study and consider the implications of automation as applied to their own properties.

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Austin AP-10 end mill type (top) and AP-10D plug type cutter bits.

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New AP-10 end mill and AP-10D plug type cutter bits are precision manufactured by Austin Powder to penetrate faster . . . last longer . . . reduce mining costs.

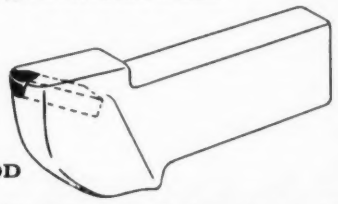
Carbide inserts are brazed in special alloy steel shanks to assure strongest possible support. As a result, tool failure, due to tip loss, is virtually eliminated even under most severe cutting conditions. This assures more production time, less time lost in bit changes.

Your Austin representative will gladly show you how these and other features of AP bits can improve your operations. Call him today! AA-8926

Maximum carbide support slashes tip loss

AP-10

Three sides and extreme end of carbide insert in Austin end mill type bit are brazed to shank.



AP-10D

Entire surface of carbide insert in Austin plug type bit with exception of cutting edge is brazed to shank.

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